23 April 2026

Aria Rewiti
s7(2)(a) [redacted]

Tēnā koe Aria,

Request for Information – Local Government Official Information and Meetings Act (LGOIMA) 1987

We refer to your official information request dated 3 March 2026, seeking information about the Silverstream Landfill operational contract and associated odour and gas management plans. Specifically, you requested:

1. *the Silverstream operational contract document*
2. *the odour and gas management plan for the landfill*

On 27 March 2026, Council wrote to you advising that, under section 14(b) of the LGOIMA, the timeframe for responding to your request was being extended. This extension was required to allow Council additional time to consult with a third party before making a decision on the release of some of the information within scope of your request. You were advised that Council expected to provide its response no later than 23 April 2026.

Answer:

In response to your request, please find attached a copy of the Silverstream Landfill Operations Contract. This contract includes provisions relating to odour and gas management at the landfill.

Some information has been withheld from the contract under the following provisions of the LGOIMA:

- section 7(2)(a), to protect the privacy of natural persons
- section 7(2)(b)(ii), as release would be likely to unreasonably prejudice the commercial position of a third party contractor
- section 7(2)(j), to prevent the disclosure or use of official information for improper gain or improper advantage

Council has considered whether the public interest in release of the withheld information outweighs the need to withhold it and has concluded that it does not.

You have the right to seek an investigation and review by the Ombudsman of this response. Information about how to make a complaint is available at: **Office of the Ombudsman - Complaints**, or freephone 0800 802 602.

Please note that this response to your information request may be published on Hutt City Council's website: **Proactive releases - Hutt City Council**.

Ngā mihi nui

Rebekah van der Splinter
Senior Advisor, Official Information and Privacy

CONTRACT DOCUMENT

VOLUME 1

RELEASED UNDER THE LOCAL GOVERNMENT AND MEETINGS ACT 1987

HUTT CITY
TE AWA KAIRANGI

Silverstream Landfill Operations Contract

Contract AD22 -2102

Prepared for
Hutt City Council | Te Awa Kairangi
Prepared by
Tonkin & Taylor Ltd
Date
January 2023
Job Number
82948.1000 v1

Together we create and sustain a better world
www.tonkintaylor.co.nz

Document control

Title: Silverstream Landfill Operations Contract (AD22-2102) VOL 1					
Date	**Version**	**Description**	**Prepared by:**	**Reviewed by:**	**Authorised by:**
28/01/23	1	Final	SOTU	SJG HEC	EDB

Distribution:

Hutt City Council |Te Awa Kairangi	1 PDF electronic copy
Waste Management New Zealand	1 PDF electronic copy
Tonkin & Taylor Ltd (FILE)	1 PDF electronic copy

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Contract Agreement

CONTRACT FOR	Silverstream Landfill Operations Contract	
CONTRACT NUMBER	AD22 - 2102	
THIS AGREEMENT is made on		
BETWEEN	Waste Management NZ Ltd	(the ***Contractor***)
AND	Hutt City Council	(the ***Principal***)

IT IS AGREED as follows:

1. The Contractor shall carry out the obligations imposed on the Contractor by the Contract.
2. The Principal shall pay the Contractor the Contract Price for the proper execution of the Contract Works at the times and in the manner provided in the Contract.
3. Each party agrees to the terms and conditions as set out in the Contract.
4. The Contract comprises the following documents:
   - (a) This Contract Agreement;
   - (b) Schedule 1: Special Conditions of Contract – Specific Conditions of Contract annexed;
   - (c) Schedule 2: Special Conditions of Contract – Other Conditions of Contract annexed;
   - (d) The General Conditions of Contract NZS 3917:2013 (being clauses 1-15 of NZS 3917:2013);
   - (e) Schedule 19: Partnering Values;
   - (f) Schedule 21: The Schedule of Prices;
   - (g) Schedule 22: The Specification (including Appendices in Volume 2);
   - (h) Schedule 23: Contract Drawings;
   - (i) Schedule 24: The Request for Tender attached to this Contract, dated 4 April 2022;
   - (j) Schedule 26: Post-tender documents and Notices to Tenders;
   - (k) All other Schedules to this Contract;
   - (l) The Appendices to this Contract;
   - (m) Landfill Management Plan (annexed in Schedule 28, Volume 2);
   - (n) Erosion and Sediment Control Framework (annexed in Schedule 29, Volume 2); and
   - (o) Schedule 25: Contractor's Tender.

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5. The Contract constitutes the entire agreement between the Principal and the Contractor with respect to the subject matter of the Contract and supersedes all prior communications, negotiations and agreements with respect to the subject matter of the Contract. The parties will not be bound by or be liable for any statement, representation, promise, inducement or understanding of any kind or nature in respect of the subject matter of the Contract not recorded in the Contract. Notwithstanding the foregoing this provision will not limit the liability of a party in respect of fraudulent acts or omissions of that party, and for the avoidance of any doubt this provision is not intended to and nor will it limit or prejudice any rights and/or remedies of a party at law, equity or otherwise in relation to or in connection with the Contract.

SIGNED BY s7(2)(a) Authorised Signatory of Contractor

WITNESS TO THE SIGNATURE OF THE CONTRACTOR: s7(2)(a)

(name, occupation, address)

SIGNED BY s7(2)(a) Authorised Signatory of Principal

WITNESS TO THE SIGNATURE OF THE PRINCIPAL: s7(2)(a)

(name, occupation, address) Ness Franks

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General Conditions of Contract

The General Conditions of Contract shall be those set out in clauses 1-15 of NZS 3917:2013 – "Conditions of contract for building and civil engineering – Fixed term" which are supplemented and amended by Schedule 1 – Special Conditions of Contract – Specific Conditions of Contract and Schedule 2 – Special Conditions of Contract – Other Conditions of Contract

The Contractor is deemed to be familiar with clauses 1-15 of NZS 3917:2013 and to have its own copy. The Contractor shall also ensure that all Subcontractors are familiar with clauses 1-15 of NZS 3917:2013 and have their own copies. A copy of clauses 1-15 of NZS 3917:2013 is deemed to be included as part of the Contract.

Schedules to General Conditions of Contract

VOLUME 1

Schedule 1	Special Conditions of Contract – Specific Conditions of Contract as annexed *(replaces Schedule 1 of NZS 3917:2013)*
Schedule 2	Special Conditions of Contract – Other Conditions of Contract as annexed *(replaces Schedule 2 of NZS 3917:2013)*
Schedule 3	Form of Contractor's performance bond as annexed *(replaces Schedule 3 of NZS 3917:2013)*
Schedule 4	Not used
Schedule 5	Not used
Schedule 6	Not used
Schedule 7	Not used
Schedule 8	Information on Contractor arranged Plant insurance as annexed (as per NZS 3917:2013)
Schedule 9	Information on public liability insurance as annexed *(as per NZS 3917:2013)*
Schedule 10	Information on Contractor arranged motor vehicle insurance as annexed *(as per NZS 3917:2013)*
Schedule 11	Not used
Schedule 12	Not used
Schedule 13	Not used
Schedule 14	Not used
Schedule 15	Certificate on Expiry as annexed (*as per NZS 3917:2013*)

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Schedule 16 Final Completion Certificate as annexed (*as per NZS 3917:2013*)
Schedule 17 Form of Subcontractor Continuity Guarantee as annexed in Schedule 17
Schedule 18 Not used
Schedule 19 Partnering Values as annexed in Schedule 19
Schedule 20 Method of Measurement and Basis of Payment as annexed in Schedule 20
Schedule 21 Schedule of Prices as annexed in Schedule 21
Schedule 22 Specifications (Part 1 of 2) as annexed in Schedule 22
Schedule 23 Contract Drawings as annexed in Schedule 23

VOLUME 2

Schedule 24 The Request for Tender attached to this Contract, dated 4 April 2022
Schedule 25 Contractor's Tender as annexed in Schedule 25
Schedule 26 Post-Tender Documents, and Notices to Tenderers as annexed in Schedule 26
Schedule 27 Specification (Part 2 of 2, Appendices) as annexed in Schedule 27
Schedule 28 Landfill Management Plan as annexed in Schedule 28 (including appendices)
Schedule 29 Erosion and Sediment Control Framework as annexed in Schedule 29

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Schedule 1 – Special Conditions of Contract – Specific Conditions of Contract

These special conditions supplement and amend the General Conditions of Contract.

Clause in General Conditions	Title and subject matter	Specific condition data (Expand cells if required or add a reference to further detail provided in Schedule 2)
1.	**INTERPRETATION**	
1.2	**Definitions**	
	The Principal is:	Hutt City Council
	of:	30 Laings Road, Lower Hutt
1.2, 10.2, 12.4.4	**Separable Portions**	
	• Are there any Separable Portions in this Contract?	Yes: • **Separable Portion 1 (SP1):** 'Transfer Station' Refer to Specification Section 4.3
2.	**THE CONTRACT**	
2.1	**Type of Contract**	
2.1.1	This Contract is a:	(select one to apply (a), (b), or (c))
	(a) Lump sum contract governed by 2.2;	□
	(b) Measure and value contract governed by 2.3;	✓ To clarify, there will be certain lump sum items forming part of the Contract Works. These lump sum items are identified in the Schedule of Prices.
	(c) Cost reimbursement contract governed by 2.4;	□
2.4	**Cost reimbursement contract**	
2.4.1	Allowance(s) which are to be added to Net Cost in a cost reimbursement contract or for parts of the Contract Works which are required to be carried out on a cost reimbursement basis: (if percentages are shown as zero or nil, allowances for overheads and profit are deemed to be included in Net Cost.)	
	• Allowance for On-site Overheads:	Not applicable
	• Allowance for Off-site Overheads and Profit:	Not applicable
2.4.4	Indicative estimates of the Contract Price:	
	Are indicative estimates required?	No
2.5	**Local authority contracts**	
2.5.1	Is this Contract a local authority contract to which 2.5.2 applies?	Yes
2.7	**Documents prepared by the Engineer or Principal**	

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Clause in General Conditions	Title and subject matter	Specific condition data (Expand cells if required or add a reference to further detail provided in Schedule 2)
2.7.1	Copies of the Contract shall be supplied without charge to the Contractor in the following electronic form:	PDF files plus the Schedule of Prices in MS Excel format.
2.8	**Documents prepared by the Contractor**	
2.8.2	Copies of documents referred to in 2.8.2 shall be supplied without charge to the Engineer:	
	• Number of hard copy sets:	2 sets
	• In the following electronic form:	MS Word, MS Excel or PDF as instructed by the Engineer
3.	**BONDS**	
3.1	**Contractor's Bond**	
3.1.1	Is a Contractor's Bond required?	Yes
3.1.2	If yes, the amount of the Contractor's Bond shall be:	s7(2)(b)(ii)
3.2	**Principal's Bond**	
3.2.1	Is a Principal's Bond required?	No
5.	**GENERAL OBLIGATIONS**	
5.4	**Occupancy of the Site**	
5.4.4	Limits on the Contractor's right of entry to adjoining properties are:	The Contractor has no rights to enter adjoining properties unless granted prior permission by the owner and occupier. Such permission must be recorded in writing and communicated to the Engineer's Representative.
5.5	**Separate Contractors**	
5.5.1	Separate Contractors who may be carrying out work on the Site concurrently with Contract Works are:	The Site is currently shared with: • Capital works contractor, Leach and Co. • Gas extraction and destruction contractor, LMS Energy • Recycling contractor, Earthlink • HCC Consultants, Tonkin & Taylor Undertaking work within the landfill under approval from the Principal, all of whom may, from time to time, be undertaking works on or be present on the Site.
5.5.2	Are facilities for Separate Contractors required?	Yes- provision of plant and/or materials to other Separate Contractors may be instructed by the Engineer from time to time. Refer also to Specifications.
5.6	**Care of the works and Site**	
5.6.6(f)	Further risks specifically excepted are:	None
5.10	**Programme**	
5.10.1	Programmes are to be prepared at intervals of:	One month

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Clause in General Conditions	Title and subject matter	Specific condition data (Expand cells if required or add a reference to further detail provided in Schedule 2)
5.10.2	Each revision shall be prepared in detail for the following period following the programme revision date:	One month
5.11	**Compliance with laws**	
5.11.3	Exceptions to the Principal's obligations to obtain licenses under 5.11.3 are:	None, the only licences for which the Principal is responsible for obtaining for the purpose of the Contract is: • Resource Consents (as more particularly set out in the Specifications and Appended to the Landfill Management Plan).
5.11.4	Exceptions to the Contractor's obligation to give notices and obtain other licenses under 5.11.4 are:	None. The Contractor must obtain all licences for the Contract Works, except the licences referred to in 5.11.3 above.
5.11.8	Prior to the issue of the Certificate on Expiry:	(select one to apply, (a), (b), or (c))
	(a) Producer Statements in the form of Schedule 6 are required;	No
5.17	**Safety plan**	
	Is a Contract safety plan required to be prepared by the Contractor?	Yes, details of the requirements are set out in the Specifications
5.18	**Quality plan**	
	Is a quality plan required to be prepared by the Contractor?	Yes, details of the requirements are set out in the Specifications
5.19	**Traffic management plan**	
	Is a traffic management plan required to be prepared by the Contractor?	Yes, details of the requirements are set out in the Specifications
5.20	**As-built drawings, manuals, and maintenance records**	
5.20.1(a)	Are as-built drawings required to be prepared by the Contractor?	Yes, to the extent required by the Principal or the Engineer from time to time.
5.20.1(b)	Are operation and maintenance manuals required to be prepared by the Contractor?	Yes, to the extent required by the Principal or the Engineer from time to time.
5.20.1(c)	Are maintenance records required to be prepared or updated by the Contractor?	Yes, details of the requirements are set out in the Specifications
5.20.4	Frequency for delivery of maintenance records prepared or updated by the Contractor?	Monthly as set out in the Specification
6.	**THE ENGINEER**	
6.1	**Appointment of Engineer**	
6.1.2	The Engineer is:	s7(2)(a) [redacted]
	whose professional qualification is:	
8.	**INSURANCES**	
8.1	**General**	
8.1.1	The party identified below shall arrange the following insurances referred to in the following clauses:	
	8.3 or 8.8 Construction	

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Clause in General Conditions	Title and subject matter	Specific condition data (Expand cells if required or add a reference to further detail provided in Schedule 2)
	8.9 Existing property	Not required
	8.4 Plant	Contractor
	8.5 or 8.10 Public liability	Contractor
	8.5.2 Motor vehicle liability	Contractor
	8.6 Professional indemnity	Not required
8.1.6	The following forces of nature shall be specifically insured under 8.3, 8.8, or 8.9 as applicable:	
	(a) Landslip:	Not applicable
	(b) Earthquake:	Not applicable
	(c) Tsunami:	Not applicable
	(d) Tornado:	Not applicable
	(e) Cyclone:	Not applicable
	(f) Storm:	Not applicable
	(g) Flood:	Not applicable
	(h) Lightning strike:	Not applicable
	(i) Volcanic activity:	Not applicable
	(j) Hydrothermal activity:	Not applicable
	(k) Geothermal activity:	Not applicable
8.3, 8.8	**Construction insurance** *(These items are required to be completed whether the Contractor or the Principal is the insuring party (see 8.1 above))*	
8.3.2, 8.8	The following shall have their respective interests noted in the construction insurance policy:	Not applicable
8.3.3, 8.8	Where construction insurance is required (*see 8.1 above*), the amount of insurance to be effected for the Contract Works and Materials shall be for not less than the sum attributable to the Contract Price, after acceptance of the tender or other offer, plus the following allowances:	
	(a) An allowance for the Cost of demolition, disposal and preparation for replacement work, equal to:	(select one to apply, (i) or (ii))
	(i) The amount in the right hand column:	
	(ii) The percentage in the right hand column of the Contract Price adjusted as above:	✓ Not applicable (%)
	(b) An allowance for professional fees including the Cost of clerks of works and inspectors, equal to:	(select one to apply, (i) or (ii))
	(i) The amount in the right hand column:	
	(ii) The percentage in the right hand column of the Contract Price adjusted as above:	✓ Not applicable (%)
	(c) An allowance for items to be incorporated in the Contract Works, the Cost of which is not included in the said Contract Price amount, equal to:	(select one to apply, (i) or (ii))

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Clause in General Conditions	Title and subject matter	Specific condition data (Expand cells if required or add a reference to further detail provided in Schedule 2)
	(i) The amount in the right hand column	
	(ii) The percentage in the right hand column of the Contract Price adjusted as above:	✓ Not applicable (%)
	(d) An allowance for an increase in the said Contract Price amount due to Variations equal to:	(select one to apply, (i) or (ii))
	(i) The amount in the right hand column:	
	(ii) The percentage in the right hand column of the Contract Price adjusted as above:	✓ Not applicable (%)
	(e) An allowance for increased construction Costs due to inflation equal to:	(select one to apply, (i) or (ii))
	(i) The amount in the right hand column:	Not applicable
	(ii) The percentage in the right hand column of the Contract Price adjusted as above:, stated in the right hand column	
8.4	**Contractor arranged Plant insurance**	
	Where Plant is required to be insured (see 8.1 above):	(select one to apply, (a) or (b))
	(a) The Contractor shall insure the following items of Plant on the Site for the amounts stated:	□ (list specific items)
	(b) The Contractor shall insure each item of Plant on the Site having a current market value of more than:	s7(2)(b)(ii) [redacted]
8.5	**Contractor arranged public liability insurance**	
8.5.1	Where required (see 8.1 above), public liability insurance shall be effected by the Contractor for an amount not less than:	s7(2)(b)(ii) [redacted]
	Such public liability insurance may include sub-limits:	s7(2)(b)(ii) [redacted]
	• For liability arising out of vibration, weakening or removal of support, of not less than:	
	• For liability under the Forest and Rural Fires Act 1977, of not less than:	Not applicable (repealed)
8.5.2	Where required (see 8.1 above), motor vehicle third party liability insurance shall be effected for an amount not less than:	s7(2)(b)(ii) [redacted]
8.6	**Contractor arranged professional indemnity insurance**	
8.6.1	Where required (see 8.1 above), professional indemnity insurance in respect of any design undertaken by, or on behalf of, the Contractor for the purpose of completing the Contract Works shall be effected for an amount not less than:	
	• For any one claim:	Not applicable

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Clause in General Conditions	Title and subject matter	Specific condition data (Expand cells if required or add a reference to further detail provided in Schedule 2)
8.6.2	Sub-limits of liability for design of parts of the Contract Works by Subcontractors shall be not be less than:	Not applicable
8.8	**Principal arranged construction insurance** *(refer also to 8.3)*	
	In accordance with 8.7.2, the insurance policy wording title is:	Not applicable
	In accordance with 8.7.2, the extraordinary exclusions, conditions, warranties or endorsements to the policy are:	Not applicable
8.8.1	Where the Principal is required to effect construction insurance (see 8.1 above)	
	The lead insurer is:	Not applicable
	Address of lead insurer:	
	The Nominal Deductibles are:	
	• For damage arising out of the Contract Works:	Not applicable
	• For other claims:	
	• For natural perils:	
8.9	Principal arranged existing property insurance	
	In accordance with 8.7.2, the insurance policy wording title is:	Not applicable
	In accordance with 8.7.2, the extraordinary exclusions, conditions, warranties, or endorsements to the policy are:	
8.9.1	Where the Principal is required (see 8.1 above), to effect existing property insurance:	
8.9.1(a)	The existing structure or property is:	Not applicable
	• The replacement value to be insured is:	
	• The lead insurer is:	
	• Address of lead insurer:	
	The Nominal Deductibles are:	
	• For damage arising out of the Contract Works:	Not applicable
	• For other claims:	
	• For natural perils:	
8.9.1(b)	Other structures or property in the vicinity are:	Not applicable
	• The replacement value to be insured is:	
	• The lead insurer is:	
	• Address of lead insurer:	
	The Nominal Deductibles are:	
	• For damage arising out of the Contract Works:	Not applicable
	• For other claims:	
	• For natural perils:	
8.9.1(c)	Contents insurance:	
	• The replacement value to be insured is:	Not applicable
	• The lead insurer is:	
	• Address of lead insurer:	

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Clause in General Conditions	Title and subject matter	Specific condition data (Expand cells if required or add a reference to further detail provided in Schedule 2)
	The Nominal Deductibles are:	
	• For damage arising out of the Contract Works:	Not applicable
	• For other claims:	
	• For natural perils:	
8.10	**Principal's option to insure public liability**	
8.10.1	Where required (see 8.1 above), the Principal shall effect public liability insurance for an amount not less than:	Not applicable
	The lead insurer is:	
	Address of lead insurer:	
	The Nominal Deductible is:	
	In accordance with 8.7.2:	
	• the policy wording title is:	Not applicable
	• extraordinary exclusions, conditions, warranties, or endorsements to the policy are:	
8.10.2	Such public liability insurance may include sub-limits for: (specify as applicable or state 'not applicable')	
	• Liability arising out of vibration, weakening or removal of support:	Not applicable
	• Liability under the Forest and Rural Fires Act 1977:	
9.	**VARIATIONS**	
9.3	**Valuation of Variations**	
9.3.9	For On-site Overheads:	(select one to apply, (a) or (b))
	(a) The prices and rates in the Schedule of Prices are inclusive of full allowance for On-site Overheads;	✓
	(b) The prices and rates in the Schedule of Prices are exclusive of On-site Overheads.	□
9.3.7, 9.3.9	The allowance for On-site Overheads to be added in accordance with 9.3.9 is (this allowance only applies to the extent that a Variation is required to be valued on a Net Cost basis under 9.3.7 due to there not being an applicable rate or price in the Schedule of Prices and a new derived rate or price has not been determined under 9.3.6,	(select one to apply, (i), (ii), (iii), or (iv))
	(i) Agreed percentage:	s7(2)(b)(ii)
	(ii) As nominated in the Schedule of Prices;	□
	(iii) As nominated in the Contractor's tender;	□
	(iv) A reasonable percentage.	□
9.3.10	For Off-site Overheads and Profit:	(select one to apply, (a) or (b))
	(a) The prices and rates in the Schedule of Prices are inclusive of Off-site Overheads and Profit;	✓

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Clause in General Conditions	Title and subject matter	Specific condition data (Expand cells if required or add a reference to further detail provided in Schedule 2)
9.3.7, 9.3.10	The allowance for Off-site Overheads and Profit to be added in accordance with 9.3.10 and, where applicable, 9.4.2 is:	(select one to apply, (i), (ii), (iii), or (iv))
	(i) Agreed percentage:	s7(2)(b)(ii) [redacted]
	(ii) As nominated in the Schedule of Prices;	□
	(iii) As nominated in the Contractor's tender;	□
	(iv) A reasonable percentage.	□
9.3.14	For processing of Variations, the percentage to be paid in accordance with 9.3.14 is:	(select one to apply, (a), (b), (c), or (d))
	(a) Agreed percentage:	s7(2)(b)(ii) [redacted]
10.	**CONTRACT WORKS PERIOD**	
10.1	**Date of Commencement**	
	(a) For the Contract Works:	The date that is 2 Months after the Date of Acceptance of Tender
	(b) For any Separable Portions:	
10.2	**Date of Expiry**	
	(a) For the Contract Works:	10 Years from the Date of Commencement as may be adjusted in accordance with 12.14A but which will not extend beyond the Expiry Date Cap.
	(b) For any Separable Portions:	**SP1:** 2 Years from the Date of Commencement as may be adjusted in accordance with 10.2A and section 4.3 of the Specifications but which will not extend beyond the Expiry Date Cap.
11.	**DEFECTS LIABILITY**	
11.4	**Final Completion Certificate**	
11.4.2(a)	Prior to issue of the Final Completion Certificate:	(select one to apply, (a), (b), or (c))
	(a) Producer Statements in the form of Schedule 6 are required;	Not applicable
11.4.2(b)	Prior to the issue of the Final Completion Certificate: (select one to apply, (a) or (b))	
	(a) As-built drawings and operation and maintenance manuals are required	✓ (refer Specification)
11.4.2(c)	Prior to the issue of the Final Completion Certificate: (select one to apply, (a) or (b))	
	(a) Outstanding maintenance records are required;	✓ (refer Specification)
11.6	**Warranties**	
11.6.1		(select one to apply, (a) or (b))
	(a) No warranties are required;	✓
	(b) The Contractor shall provide warranties as set out in the Contract for the following items of work:	
11.7	**Guarantees**	

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Clause in General Conditions	Title and subject matter	Specific condition data (Expand cells if required or add a reference to further detail provided in Schedule 2)
	(a) No guarantees are required;	
	(b) The Contractor will provide Subcontractor continuity guarantees in the form set out in Schedule 17, duly signed by the applicable Subcontractors, in respect of any Subcontractor services or packages which the Engineer notifies the Contractor of from time to time.	✓
12	**PAYMENTS**	
12.1	**Contractor's payment claims**	
12.1.3(b)	**Advances for Materials delivered to the Site**	(select one to apply, (a) or (b))
(iii)	(a) Advances for Materials delivered to the Site but which have yet to be incorporated in the Contract Works shall not be made;	✓
12.1.3(b)	**Advances for Temporary Works or Plant**	(select one to apply, (a) or (b))
(iv)	(a) Advances for Temporary Works or Plant shall not be made;	✓
12.1.3(b)	**Advances for Materials not yet on Site**	(select one to apply, (a) or (b))
(iv)	(a) Advances for Materials not on Site shall not be made;	✓ (Unless a vesting certificate is obtained from the supplier for the materials as agreed with the Engineer)
12.3	**Retention monies**	
12.3.1, 12.3.2	Retentions shall or shall not apply as follows:	(select one to apply, (a) or (b))
	(a) Retentions shall not apply.	✓
12.8	**Cost fluctuations**	(select one to apply, (a), (b), or (c))
	(a) Cost fluctuations shall not be paid;	□
	(b) Cost fluctuations shall be paid in accordance with Appendix A;	✓
12.9	**Provisional Sums**	(select one to apply, (a) or (b))
	(a) There are no Provisional Sums	□
	(b) There are Provisional Sums as set out in:	✓ The Schedule of Prices.
12.10	**Provisional Items**	(select one to apply, (a) or (b))
	(a) There are no Provisional Items	□
	(b) There are Provisional Items as set out in:	✓ The Schedule of Prices.
12.11	**Prime Cost Sums**	(select one to apply, (a) or (b))
	(a) There are no Prime Cost Sums	✓
	(b) There are Prime Cost Sums as set out in:	□
12.12	**Contingency sums**	(select one to apply, (a) or (b))
	(a) There are no contingency sums	□
	(b) There are contingency sums as set out in:	✓ The Schedule of Prices.
12.13	**Goods and services tax**	
12.13.2	Payment Schedules provided by the Engineer:	(select one to apply, (a) or (b))
	(a) Shall not be in the form of a tax invoice;	□

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Clause in General Conditions	Title and subject matter	Specific condition data (Expand cells if required or add a reference to further detail provided in Schedule 2)
	(b) Shall be in the form of a buyer created tax invoice and the parties agree not to issue any other tax invoice for items covered by the Payment Schedule.	✓
12.14.	**Performance payments**	(select one to apply, (a) or (b))
12.14.1, 12.14.2	(a) Performance payments shall apply;	✓ Performance Bonus Payments in accordance with the Section 6 of the Specification.
12.15	**Liquidated damages**	(select one to apply, (a) or (b))
12.15.1, 12.15.2	(a) Liquidated damages shall not apply;	✓
13.	**DISPUTES**	
13.4	**Arbitration**	
13.4.3	If required, the arbitrator shall be nominated by the following Person:	The President of Arbitrators' and Mediators Institute of New Zealand In (AMINZ)
15.	**SERVICE OF NOTICES**	
15.1.2	For the purpose of service of written notice:	
	(a) The address of the Principal is:	
	Postal address:	Private bag 31-912, Lower Hutt 5040
	Delivery address:	30 Laings Road, Lower Hutt
	Mark for the attention of:	Jörn Scherzer, Head of Climate & Solid Waste
	Email address:	waste@huttcity.govt.nz or as notified from time to time, provided that any document (other than a payment claim) served under the Construction Contract Act 2002
	Other agreed means of electronic communication and address detail:	Not applicable
	(b) The address of the Contractor is:	
	Postal address:	
	Delivery address:	
	Mark for the attention of:	
	Email address:	
	Other agreed means of electronic communication and address detail:	
	(c) The address of the Engineer is:	
	Postal address:	Tonkin and Taylor Ltd PO BOX 2083, Wellington
	Delivery address:	Tonkin and Taylor Ltd Level 4, Harbour Tower, 2 Hunter street

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Clause in General Conditions	Title and subject matter	Specific condition data (Expand cells if required or add a reference to further detail provided in Schedule 2)
		Wellington
	Mark for the attention of:	s7(2)(a)
	Email address:	s7(2)(a) tonkintaylor.co.nz
	Other agreed means of electronic communication and address detail:	Not applicable

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Schedule 2 – Special Conditions of Contract – Other Conditions of Contract

1 INTERPRETATION

1.2 Definitions

Add the following new definitions:

"***Assets***" means:

(a) the landfill infrastructure owned by the Principal, as at the Date of Commencement, as set out or referred to in the Specification; plus

(b) any additional assets incorporated within the scope of the Contract Works under Section 9, such as in respect of any Capital Works Services; but less

(c) any Assets removed from the scope of the Contract Works under an Asset Scope Instruction.

"***Asset Scope Instruction***" has the meaning given to that term in 16.3.1.

"***BOI Viable"*** means any additional works and/or services, Plant, Materials, or processes, proposed to be added, substituted, or augmented in relation to the Contract Works for the benefit of one or more Key Result Areas and/or the Principal's Broader Outcome and Innovation goals, which are of:

(a) no greater whole-of-life cost to the Contractor; and

(b) no lesser operational suitability and capacity for the Contract Works.

"***Broader Outcomes Works"*** means the works and/or services that form part of a Broader Outcomes Plan that has been accepted by the Principal under 22.1.

"***Broader Outcomes and Innovation***" means the Broader Outcomes and Innovation framework as set out in, or contemplated by, section 7 of the Specifications.

"***Capital Works Services***" means any additional works which the Principal instructs the Contract to carry out under the Contract that are in the nature of capital or construction works, as distinct from operations and maintenance.

"Covid" means the coronavirus disease of that name, as classified by the World Health Organisation on 11 February 2020, also known as COVID-19, coronavirus disease 2019, novel coronavirus, 2019-nCoV and SARS-CoV-2 and shall include any subsequent strains of Covid.

"*Covid Impact*" means (from time to time) the direct interference with:

(a) the supply of Materials, Plant and/or Temporary Works required to carry out the Contract Works and/or Temporary Works;

(b) the ability of the Contractor to progress the Contract Works in accordance with the current programme; or

(c) the availability of Contractor or Subcontractor labour or personnel,

that is directly caused by Covid.

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"Erosion and Sediment Control Framework" means the Erosion and Sediment Control Framework annexed in Schedule 29.

"Expiry Date Cap" has the meaning given to that term in 12.14A.1.

"***Governance Group***" means the group established pursuant to 18.2.

"***Council***" has the same meaning as the Principal.

"***Encumbrance***" means any mortgage, lien, pledge, claim, charge, retention of title, security or encumbrance of any kind, including any security interest under the Personal Property Securities Act 1999.

"***Force Majeure***" means any events or circumstances that are exceptional and interfere with the progress of the Contract Works and that were:

(a) not reasonably foreseeable by an experienced contractor at the time of tendering;

(b) not due to any breach or negligence of the affected party or any Person for whom the affected party is responsible; and

(c) beyond the affected party's reasonable control,

provided that notwithstanding the foregoing:

(i) the foreseeability requirement at (a) above will not apply to a Covid Impact; and

(ii) the following events and circumstances will not be Force Majeure for the Contractor:

A. late performance by a Subcontractor (unless such late performance would be excused if the Subcontractor was a party to the Contract);

B. the occurrence of any shortage of Materials, Plant, Temporary Works, personnel or other resources (except to the extent caused by a Covid Impact);

C. the event or circumstance is constituted or caused by an Insolvency Event of the Contractor or a Subcontractor, or lack of funds for any reason;

D. it is an event or circumstance that the Contract expressly identifies as one for which the Contractor was responsible for;

E. risks associated with the event or circumstance have been expressly accepted by the Contractor under the Contract; and

F. weather conditions (other than Unusually Inclement Weather).

"***Good Industry Practice***" means, without limiting or prejudicing any higher standards or higher requirements under the Contract, the exercise of that degree of skill, care, diligence, prudence (including good, safe and prudent practice) and foresight that would reasonably be expected to be observed by a highly skilled and highly experienced contractor engaged in carrying out activities the same as or similar to the Contract Works under the same or similar circumstances.

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"***Hazardous Substances***" means any hazardous substance as defined in Section 2 of the Hazardous Substances and New Organisms Act 1996.

"***Handover Plan***" has the meaning given to that term in 5.16A.3.

"***Health and Safety Requirements"*** has the meaning given to that term in 5.7A.2.

"***Innovation Fund Cap"*** means the annual provisional sum for Broader Outcomes and Innovation as set out in the Schedule of Prices and as may be adjusted under section 7 of the Specifications and/or under 22.2.

"***Insolvency Event***" means, in respect of the applicable entity, that entity:

(a) being placed into bankruptcy, liquidation, administration, receivership or statutory management or having an official assignee, liquidator, receiver, trustee, manager, administrator, statutory manager or similar appointed in respect of it or all or any of its business or property;

(b) being unable, or presumed by law unable, to pay its debts as they fall due;

(c) entering into an assignment for the benefit of or entering into or making any arrangement or composition with, its creditors;

(d) being subject to a resolution or any proceeding for the winding up or liquidation of that entity (whether on a voluntary or involuntary basis) other than for a bona fide solvent reconstruction and other than where such resolution or proceeding is formally discharged or dismissed in full within 10 Working Days of the initiation thereof; or

(e) being subject to any event (in any jurisdiction) which is analogous to any of the events listed in paragraphs (a) to (d).

"***Key Result Areas***" means the Key Result Areas as set out in, or contemplated by, section 7 of the Specifications.

"Landfill Management Plan" means the Landfill Management Plan annexed in Schedule 28 (including appendices).

"***LGOIMA***" has the meaning given to that term in 19.5.1.

"***New Assets***" has the meaning given to that term in 16.1.1.

"***Performance Bonus Payment***" means the monthly instalment performance bonus payment at the agreed rate as set out in the Schedule of Prices.

"***Performance Indicators***" means the Performance Indicators as set out in, or contemplated by, section 6 of the Specifications.

"***Prohibited Practice***" means giving, offering or accepting, directly or indirectly, any money, fees, commissions, personal services, credit, gift, gratuity, thing of value or compensation of any kind, to or from any Person (including the Principal, any authority and any officer, employee, adviser, contractor or agent of the same) in order to influence the award of the Contract or of any subcontract and/or in order to influence the terms, conditions, performance, administration or termination of the Contract or of any

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subcontract. Prohibited Practice excludes customary promotional material and occasional business entertainment (limited in value to the reasonable cost of a meal).

"***Proposed Time for Completion of the Variation***" has the meaning given to that term in 9.1A.1.

"***RMA***" means the Resource Management Act 1991.

"*Transfer Station Works"* means the works to be performed in respect of the 'transfer station' referred to in Section 4.3 of the Specifications and referred to as SP1 at 1.2, 10.2, 12.4.4, Schedule 1.

*"**Unusually Inclement Weather**"* means rainfall, wind conditions or snow at the Site that, over the particular Month in question, exceeds, by more than 20%, the 5 year average rainfall, wind conditions or snow for that Month recorded by NIWA at the weather station closest to the Site. Accordingly, whether or not there has been Unusually Inclement Weather cannot be ascertained until the end of the particular Month.

*"**Wilful Misconduct**"* means an act or omission engaged in intentionally without regard for, or with reckless indifference to, the foreseeable harmful consequences of that act or omission, but does not include any innocent or negligent act, omission, mistake or error of judgement that has been made in good faith.

The following definitions in the General Conditions are replaced as follows:

"***Contract Works***" means the supply and, where applicable, installation, of all labour, Plant and Materials together with all other works and services including supervision and administration, for the management, operation and maintenance of the Assets in accordance with the Contract as more particularly set out in, or contemplated by, the Specifications, the Landfill Management Plan, the Erosion and Sediment Control Plan, the Drawings and the Schedule of Prices, as well as all other works and services to be performed by the Contractor under the Contract, including any Capital Works Services and Broader Outcome Works.

"Date of Acceptance of Tender" means the date of the Contract Agreement.

"***General Conditions***" means clauses 1-15 of the New Zealand Standard (NZS) 3917:2013 "Conditions of contract for building and civil engineering – Fixed Term".

"***Schedule of Prices***" means the Schedule of Prices in Schedule 21 of the Contract.

"***Special Conditions***" means Schedules 1 and 2 of the Contract.

"***Site***" means the land and other places on, over or under which, the Assets are located together with any other places made available to the Contractor by the Principal conditionally or unconditionally for the purposes of the Contract Works. The Site has been illustrated on drawing number: 82948.1000-010 of the Contract Drawings and is contained with the specified landfill boundary.

"***Working Day***" means a calendar day, other than any Saturday, Sunday, or public holiday, on which banks are open for general banking business in Greater Wellington region.

1.3 General

1.3.9 Insert a new 1.3.9 as follows:

In the interpretation of the Contract, no rule of construction (including the contra proferentem rule) applies to the disadvantage of one party on the basis that that party put forward or drafted the Contract or any provision in it.

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1.3.10 Insert a new 1.3.10 as follows:

The words "include" or "including" will be deemed to be followed by "without limitation" or "but not limited to", whether or not they are followed by such phrases or words of like import.

1.3.11 Insert a new 1.3.11 as follows:

Where compliance with something by the Contractor is stated as being a condition precedent to having a matter treated as a Variation or where similar language is used, failure by the Contractor to strictly so comply will mean that the Contractor is not entitled to a Variation, compensation or any other relief whatsoever in relation to or in connection with the matter, and nor will the Contractor be relieved or discharged from any of its obligations or liabilities under the Contract in dealing with the matter.

2 THE CONTRACT

2.1 Type of Contract

2.1.3-
2.1.5 Insert new 2.1.3 – 2.1.5 as follows:

2.1.3 The Principal does not warrant that any quantities in the Schedule of Prices are accurate and/or complete and the Contractor is entirely responsible for satisfying itself about such things and will not be entitled to a Variation, compensation or any other relief whatsoever in relation to or in connection with any inaccuracies or incompleteness in any such quantities and will not claim otherwise.

2.1.4 The Contractor acknowledges and agrees that the rates set out in the Schedule of Prices comprise each and every rate necessary in order to properly and fully compensate the Contractor for performing all of the Contract Works, subject only to any additional compensation that the Contractor may be entitled to receive under the express provisions of the Contract for Variations and Asset Scope Instructions. In the event a specific item of the Contract Works is not expressly referred to or set out in the Schedule of Prices, that item will be deemed to be fully covered by the rates set out in the Schedule of Prices and the Contractor shall not be entitled to treat the absence any of such item in the Schedule of Prices as a Variation or claim any additional compensation for such item. The Contractor acknowledges and agrees that no new rates may be added to the Schedule of Prices unless agreed in writing by the Principal on a case-by-case basis.

2.1.5 For the avoidance of doubt, the Contractor agrees that the rates set out in the Schedule of Prices will apply to any Contract Works which are subcontracted.

2.6 Evidence of Contract

2.6.1 Deleted and replaced as follows:

Until the Contract is actually signed by the parties, there is no contract between the parties, unless the parties otherwise agree in writing (including under any signed and countersigned letter of award).

2.6.2 Deleted and replaced as follows:

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The Contractor shall execute the Contract Agreement in triplicate within 10 Working Days of receipt of the Contract from the Principal. One of the executed copies of these documents shall thereupon be returned to the Contractor and one delivered to the Engineer.

2.6.3 Deleted.

2.7 Documents prepared by the Engineer or Principal

2.7.4 Deleted and replaced as follows:

(a) Where the Contract or any of the other Drawings or Specifications which have been prepared by, or on behalf of, the Principal are considered to be ambiguous or unclear, the party discovering the same must immediately notify the other party and the Engineer of the discovery.

(b) Following a party providing the other party with notice under 2.7.4(a), the parties will meet and seek to resolve such ambiguity as soon as possible by applying the following rules:

(i) the Contract is to be read as cumulative of the Contractor's obligations;

(ii) where a performance requirement of one part of the Contract contains a more onerous obligation (for instance, in terms of quality, performance, product, material, workmanship or finish) on the Contractor than another, the more onerous obligation will, unless otherwise then agreed by the Principal, prevail;

(iii) in relation to Drawings:

(A) figured dimensions prevail over scaled dimensions;

(B) drawings to a larger scale prevail over drawings to a smaller scale; and

(C) drawings showing particular parts of the Contract Works prevail over drawings that are for a more general purpose;

(iv) if the matter cannot be resolved by applying the above rules, a document appearing higher in the list set out in clause 4 of the Contract Agreement will prevail over a document appearing lower in the said list; and

(v) if the matter cannot be resolved by applying the above rules, then the Engineer will, acting reasonably, determine the matter.

2.7.7 Add the following to the end of the first sentence of 2.7.7:

unless the late issue could have been avoided had the Contractor given the Engineer or the Principal, as applicable, timely notice of the need for the applicable instructions, documents or Drawings (any such notice must be in writing and given on a case-by-case basis, and anything in any programme, progress report or the like will not constitute such notice).

2.8 Documents prepared by the Contractor

2.8.2 The second sentence is deleted and replaced as follows:

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The Contractor hereby grants to the Principal (both for itself and on behalf of the applicable Subcontractors) an irrevocable, transferable (including by way of sublicence(s)), perpetual, unconditional, non-exclusive, royalty-free licence and right to copy and use all such Drawings and Specifications as well as any other reports, manuals, programmes, plans, aids, software, results, studies, calculations, data, other documents and information (whether in physical or electronic form) prepared by or on behalf of the Contractor (including by Subcontractors) in relation to or in connection with the Contract or the Contract Works. The Contractor will ensure that it secures all necessary rights and licences from Subcontractors in order to meet its obligations under this 2.8.2 and must execute or procure the execution of such documents and do all such things as may be necessary or reasonably desirable (from the Principal's perspective) to give effect to the provisions of this 2.8.2.

2.9 Assignment

Delete 2.9.1 and replace as follows:

2.9.1 The Contractor must not assign, charge, or novate all or any part of its rights and/or obligations under the Contract to any Person without the prior written consent of the Principal (which may be given or withheld at the Principal's sole and absolute discretion).

Delete 2.9.3 and replace as follows:

2.9.3 The Principal may, without the consent of the Contractor, assign, charge or novate all or any part of its rights and/or obligations under the Contract to any Person.

A new 2.9.4 is inserted as follows:

2.9.4 Both parties agree to execute all documentation reasonably required by the assigning, charging or novating party in order to effect and/or formalise any assignment, charge or novation permitted under the Contract to any Person.

2.10 No waiver

Deleted 2.10 and replace as follows:

2.10.1 Subject to waiver under 2.10.2, no relaxation, forbearance, delay or indulgence by either party in enforcing any of the terms and/or conditions of the Contract or the granting of time by either party to the other will prejudice, affect or restrict the rights of that party under the Contract.

2.10.2 Any waiver of a party's rights, powers or remedies under the Contract must, to be effective, be in writing, be dated, expressly refer to this 2.10.2, and be signed by an authorised representative of the party granting such waiver, and must specify the right and the extent to which it is being waived.

2.10.3 Any waiver by a party of its rights, powers and/or remedies under 2.10.2 will not operate as a waiver of its rights, powers and/or remedies in respect of any subsequent or continuing breach of the Contract.

3 BONDS

3.1 Contractor's Bond

Delete 3.1.2 and replace as follows:

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The Contractor shall, on the date which is 10 Working Days following the Date of Acceptance of Tender, provide the Principal with security in the form of a Contractor's Bond, to ensure performance of the Contractor's obligations under the Contract. The Contractor's Bond shall be for the amount stated in the Special Conditions, Schedule 1, shall be in the form set out in Schedule 3 and shall be executed by the surety named in the Special Conditions, Schedule 1 or as otherwise approved by the Principal (at its sole and absolute discretion).

The surety under the Contractor's Bond is to be and remain a financial institution with a Standard & Poors long term unsecured credit rating of A or higher, to be demonstrated to the Principal's satisfaction. If the credit rating of the surety is at any time lower than this, then the Contractor shall within 5 Working Days of such event provide to the Principal a replacement Contractor's Bond which meets the requirements of this 3.1.2.

If, in Contract Year, the Principal makes a call on the Contractor's Bond, then, no later than the date falling 1 Month after the expiry of that Contract Year, the Contractor shall provide a replacement Contractor's Bond to the Principal which meets the requirements of this 3.1.2, including the amount of the Contractor's Bond as set out in the Special Conditions, Schedule 1.

3.1.3 The words "(in a form and from a surety acceptable to the Principal)" are inserted after "replacement bond", and the reference to "3.1.7" is deleted and replaced with "3.1.8".

3.1.4 The words "Contractor and its surety have" are deleted and replaced with "surety has".

3.1.5 Deleted and replaced as follows:

If the Contractor's Bond, or any replacement Contractor's Bond required under 3.1.2 or 3.1.3, is not executed and delivered to the Principal within the required time for delivery then the Principal shall be entitled to treat such failure as a default by the Contractor under 14.2.

3.1.6-3.1.10 Deleted and replaced as follows:

3.1.6 If the Contractor has not complied with any of its obligations under the Contract or owes any money to the Principal under the Contract, the Principal (or the Engineer on the Principal's behalf) may give written notice to the Contractor stating:

(a) the Contractor's breach or the amount owed (as applicable);

(b) what the Principal requires the Contractor to do to remedy the breach or that the Principal requires the amount to be paid to it (as applicable);

(c) a specified time in which the Contractor must remedy the breach or make the payment (as applicable); and

(d) that the notice is given under this 3.1.6.

3.1.7 If:

(a) the Contractor fails to comply with the terms of the notice given under 3.1.6;

(b) the Contractor fails to comply with 3.1.2;

(c) the Contractor fails to comply with 3.1.3;

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(d) the Principal resumes exclusive occupancy of the Site or terminates the Contract under 14.2;

(e) the Principal is entitled to make a call pursuant to 14.2.7(b); or

(f) an Insolvency Event occurs in respect of the Contractor,

the Principal may call on the Contractor's Bond.

3.1.8 Within 5 Working Days after the Principal's receipt of the Final Completion Certificate for the whole of the Contract Works the Principal shall deliver to the Contractor and to the Contractor's surety a notice in writing stating that the surety is released from the Contractor's Bond and shall return the original Contractor's Bond to the Contractor, unless the Principal has any previously notified claims in which case the Contractor's Bond shall remain in full force and effect until final determination and (if applicable) payment of such claims.

3.1.9 The cost of obtaining any Contractor's Bond shall be borne by the Contractor.

4 SUBCONTRACTS

4.1 General

4.1.3 Add to end of 4.1.3:

and the Contractor shall be responsible for the acts, omissions, defaults and neglects of each and every Subcontractor or their agents, employees and consultants as if they were the acts, omissions, defaults and neglects of the Contractor.

4.1.4 A new 4.1.4 is inserted as follows:

Each subcontract entered into or proposed to be entered into by the Contractor will prohibit any assignment or novation of the subcontract by the Subcontractor and will prohibit any further subcontracting without the prior approval of the Engineer and will permit the Contractor to assign or novate the subcontract to the Principal on request by the Principal.

5 GENERAL OBLIGATIONS

5.1 General responsibilities

5.1.1 The following is inserted at the end:

Without limiting the generality of the foregoing and notwithstanding anything to the contrary, the Contractor warrants to carry out and complete the Contract Works:

(a) so as to be free from any defects; and

(b) in accordance with Good Industry Practice,

and the Contractor warrants that the Contract Works will incorporate only new and unused Materials of the quality specified in the Specifications (or, if quality is not specified in the Specifications, the Materials will be new, unused and of a quality consistent with Good Industry Practice). The Contractor must not substitute any Materials specified in the Specifications without the prior written consent of the Engineer (which it may withhold at its sole and absolute discretion).

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5.1.5 Deleted and replaced as follows:

The Contractor has full responsibility for the adequacy, stability and safety of all its Site operations and methods of carrying out the Contract Works.

5.1A Capital Works Services

A new 5.1A is inserted as follows:

5.1A Capital Works Services

5.1A.1 Following receipt of a notice to proceed from the Engineer under 9.2.1(b)(ii), the Contractor shall immediately commence carrying out the relevant Capital Works Services.

5.1A.2 The Contractor shall use its best endeavours to complete the Capital Works Services by the Proposed Time for Completion of the Variation.

5.1A.3 The Contractor shall carry out any Capital Works Services in accordance with Good Industry Practice and shall ensure that the Capital Works Services are free of defects and comply with, and are operable in accordance with, all applicable Acts, Regulations and licences (as defined in 5.11.2).

5.3 Control of employees

5.3.2 Number 5.3 as 5.3.1 and add new 5.3.2 as follows:

Subject to the following paragraph of this 5.3.2, the Contractor must employ the personnel named in the Contractor's tender in the key roles set out in the Contractors Tender (Attachment H) within 1 month of the Date of Commencement.

The Key Personnel may only be released from the Contract Works in the following cases:

(a) the Principal approves that release in writing;

(b) the person resigns permanently from the employ of the Contractor; or

(c) the person becomes incapable of continuing to act in his or her appointed capacity in relation to the Contract Works.

The Contractor shall ensure that its operators and supervisors have the necessary knowledge and experience and all other skills required to properly carry out the relevant parts of the Contract Works which those operators and supervisors have been employed by the Contractor to perform.

The Contractor shall ensure that any person who is proposed by the Contractor for a role specified in Attachment H is a person of appropriate ability, expertise and experience for that role.

The Contractor shall ensure that any person who is proposed by the Contractor to replace any person who holds a role as set out in Attachment H is a person of similar ability and expertise and appropriate experience, with any such changeover handled to ensure the continuity of the Contract Works. The Contractor shall consult with the Engineer's Representative on the suitability of any replacement candidate before confirming such replacement.

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5.4 Occupancy of the Site

5.4.1 Deleted and replaced as follows:

The Principal shall give the Contractor occupancy of the Site on the Date of Commencement for the purpose of the Contractor carrying out the Contract Works, subject to prior compliance with the Contractor's obligations under 5.17, 5.18, 5.19 and 8.2.5.

5.4.4 Delete the first three sentences.

5.5 Separate Contractors

5.5.1 Add a new third sentence as follows:

In addition, the Contractor will pro-actively facilitate the smooth and coordinated performance of the work of the Separate Contractors and comply with all obligations in respect of Separate Contractors set out in the Specifications.

5.5.2 Add a new third sentence as follows:

For the avoidance of doubt, the Contractor acknowledges and agrees that it will not be entitled to a Variation or any other relief whatsoever in relation to or in connection with any works provided by Separate Contractors that are set out in, or contemplated by, the Specifications.

5.5.3 Deleted and replaced as follows:

The Contractor acknowledges and agrees that the Principal may, from time to time and at its sole and absolute discretion, require sole occupancy of portions of the Site to be given to Separate Contractors. The Contractor will not be entitled to a Variation or any other relief whatsoever in relation to or in connection with the resulting withdrawal of a portion or portions of the Site for a period or periods of time.

5.6 Care of the Works and Site

5.6.4 Add ", including, for the purposes of this 5.6, the Assets," after "Site" in line 1.

5.7 Protection of Persons and property

5.7.1 Add ", Materials" after "Site" in the first line of 5.7.1

5.7A Further health and safety provisions

A new 5.7A is inserted as follows:

5.7A Further health and safety provisions

5.7A.1 Without limiting the generality of anything else in the Contract, the Contractor is at all times the primary party responsible for:

(a) all health and safety matters in relation to the Contract Works and any other works or services carried out by any other Worker (for the purposes of this clause "Worker" is as defined in the Health and Safety at Work Act 2015 (***HSAW Act***)) on any part of the Site and any other area under the care or control of the Contractor in relation to the Contract Works (together the ***Contract Workplace***); and

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(b) the health and safety of all Workers and other persons in the Contract Workplace involved in or in any way affected by the execution of the Contract Works or any works or services carried out by any Worker in the Contract Workplace,

for the period from the date the Contractor first granted exclusive occupancy of the Site until the Date of Expiry.

5.7A.2 The Contractor must comply with and must ensure that all Workers carrying out any works or services on any part of the Contract Workplace, comply with their obligations under the HSAW Act and all regulations, approved codes of practice and any relevant requirements of the Contractor's and/or Principal's health and safety system (collectively the ***Health and Safety Requirements***).

5.7A.3 The Contractor will consult, cooperate and coordinate activities with other entities operating on the Contract Workplace to ensure the health and safety of Workers, and other persons, in and around the Contract Workplace that are involved in, or in any way affected by, risks arising from the Contract Works or the Contract Workplace itself.

5.7A.4 The Contractor is responsible for ensuring that all necessary induction and training of all persons on the Contract Workplace in accordance with the Health and Safety Requirements is carried out and recorded by the Contractor. Records of such induction and training must be held by the Contractor and copies shall be provided to the Principal on request. The Contractor is also responsible for the supervision of all Contractor and Subcontractor personnel on any part of the Contract Workplace.

5.7A.5 The Contractor will implement and carry out an audit and inspection regime as required by the Principal and/or the Health and Safety Requirements.

5.7A.6 The Contractor has allowed in the Contract Price and in its programme for the requirements of the Contract in relation to health and safety.

5.7A.7 The Contractor warrants to the Principal that the Contractor will, so far as is reasonably practicable ensure that no act or omission of it, any Subcontractor of any other Worker on any part of the Contract Workplace, does or is likely to give rise to the issue of an improvement or prohibition notice, enforcement proceedings or a prosecution under the HSAW Act against the Principal, the Contractor, a Subcontractor and/or any other Worker.

5.7A.8 The Contractor will ensure that it reports to the Principal (in a form suitable to the Principal) on health and safety matters including but not limited to:

(a) at monthly meetings regarding ongoing identification and management (processes to eliminate or minimise) of hazards and risks associated with the Contract Works and such reporting must be included in the Contractors monthly reports (refer Specification);

(b) outcomes of audits and inspections carried out on Site;

(c) any incidents, including near misses and the corrective actions taken; and

(d) Worker engagement processes on Site.

5.7A.9 Following any Notifiable Event (as defined in the HSAW Act) the Contractor must provide immediate (no later than 1 hour after the Notifiable Event occurs) oral notification to the Engineer, and:

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(a) notify any relevant regulator(s) within the timeframe required by the relevant Health and Safety Requirements and provide a written copy of any notification to the Principal;

(b) within 24 hours provide the Principal with an incident summary that includes details of what occurred including identification of basic facts, diagrams or photographs, names of parties involved, the immediate steps taken in response, and what processes will be followed to ensure the incident does not reoccur in the immediate term;

(c) within 10 Working Days complete an investigation of the incident and provide the Principal with a report in relation to the investigation and confirmation of the timeframes to address any identified corrective actions. The Contractor can make a request to the Engineer in writing to extend the delivery and finalisation of the report by no longer than 10 Working Days, with the award at the discretion of the Engineer and given within 2 Working Days; and

(d) if requested to complete a duty-holder review (or any equivalent process) by a regulatory authority the Contractor will participate in that process.

5.7A.10 The Principal or its nominee may participate as an observer in any investigation being undertaken by the Contractor in relation to any matter relating to health and safety or initiate its own investigation in respect of the same. If the Principal initiates its own investigation, the Contractor must provide the Principal with all assistance reasonably required by the Principal for the purposes of the investigation, this includes the waiver of legal professional privilege over any investigation report prepared by, or on behalf of, the Contractor.

5.7A.11 The Principal may, at any time during performance of the Contract Works, conduct a compliance audit with respect to the Contractor's compliance with its health and safety obligations under the Contract. The Contractor must immediately comply with all requests and requirements of the Principal in relation to or in connection with any such audit. In addition, if the Principal or the Engineer is of the opinion that the Contractor has failed to comply with any part of this 5.7A, the Principal or the Engineer may advise the Contractor and instruct the Contractor to cease or not commence the Contract Works or part of the Contract Works until the Contractor complies. Any such instruction will not constitute a Variation.

5.7B Hazardous substances

Insert a new 5.7B as follows:

5.7B Hazardous substances

5.7B The Contractor will be responsible for compliance with all Acts and Regulations relating to the handling, use of and disposal of Hazardous Substances. This includes complying with the:

(a) Hazardous Substances and New Organisms Act 1996;

(b) HSAW Act;

(c) RMA; and

(d) Building Act 2004.

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The Contractor will be responsible for having a valid controlled substance licence at all times if required by the Principal or as otherwise may be required by any Act, Regulation or licence (as defined in 5.11.2). If the Contractor fails to hold the required licences this may result in the Contractor being liable in any proceedings, criminal or otherwise. For the avoidance of doubt, the Contractor shall also comply with all provisions relating to Hazardous Substances set out in the Specifications.

5.9 Materials, labour and Plant

5.9.3 Deleted and replaced as follows:

(a) Title to any Materials to be supplied pursuant to the Contract will transfer to the Principal at whichever is the earlier of the following times:

(i) when the Materials have been delivered to the Site; and

(ii) when the Principal has paid for the Materials.

(b) The Contractor warrants that at the time title to the Materials is transferred to the Principal under 5.9.3(a), it has or will have full title to the Materials free of all Encumbrances to ensure that full title in such Materials free of all Encumbrances passes to the Principal under 5.9.3(a).

(c) Title to any Materials in excess of the requirements for the Contract Works will, where required by the Principal, and to the extent title has passed to the Principal, vest in the Contractor upon the Date of Expiry, in which case the Contractor will be responsible for disposing of the same.

(d) Notwithstanding the transfer of title to the Materials, the responsibility for care thereof together with the risk of loss or damage thereto will remain with the Contractor in accordance with 5.6.

(e) No Materials on-Site will be removed from the Site without the prior written consent of the Principal, provided that the Contractor may move Materials between the Site and its off-Site depot as necessary for the purpose of carrying out the Contract Works.

5.11 Compliance with laws

5.11.9 Add the following at the end of 5.11.9:

, provided however that the foregoing will not apply in respect of matters:

(a) relating to industrial relations, company and business taxes (but not including GST) and levies (including waste disposal levies);

(b) outside of New Zealand; or

(c) which could have been reasonably foreseen by the Contractor, or a contractor exercising Good Industry Practices, on or before the Date of Acceptance of Tender.

5.11A Resource Management Act 1991

Insert a new 5.11A as follows:

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5.11A Resource Management Act 1991

5.11A.1 The Contractor shall not do anything or omit to do anything, or use Materials, substances or processes which:

(a) would or is likely to discharge a contaminant into the environment that is not in compliance with any licences (as defined in 5.11.2) applicable to the Contract Works, or would or is likely to cause the total emission of noise or landfill gas from the Site to exceed prescribed boundary noise and gas levels, or that would or is likely to cause any adverse effect on the environment; or

(b) is a breach of any duty or obligation of the Contractor under the RMA; or

(c) does or is likely to give rise to the issue of an abatement notice, enforcement proceedings or an excessive noise direction under the RMA against the Principal, Contractor, Subcontractor or any other Person.

5.11A.2 Each subcontract entered into or proposed to be entered into by the Contractor shall contain similar undertakings as those stated in 5.11A.1 from that Subcontractor in relation to the subcontract works.

5.11A.3 If the Contractor becomes aware that it is or may be in breach, or is likely to be in breach of any of its obligations under 5.11A or any Subcontractor is or may be in breach of or is likely to be in breach of the matters set out in a subcontract entered into between the Contractor and a Subcontractor that complies with 5.11A.2, then the Contractor shall immediately notify the Engineer of such breach or anticipated breach.

5.16A Handover

Insert a new 5.16A as follows:

5.16A Handover

5.16A.1 The Principal shall notify the Contractor if, following the Date of Expiry, it intends to appoint a new contractor to manage, operate and maintain the Assets. The Principal shall provide such notice to the Contractor no later than the date falling 3 Months prior to the Date of Expiry.

5.16A.2 Within 10 Working Days of receipt of notice from the Principal under 5.16A.1, the Contractor shall submit to the Engineer a handover plan for the transfer of the management, operation and maintenance of the Assets to the new contractor.

5.16A.3 Within 10 Working Days of receipt of the Contractor's handover plan, or a revised handover plan, as applicable, the Engineer shall notify the Contractor in writing whether or not he or she accepts the plan. Where the Engineer does not accept the plan, the notice shall include the Engineer's reasons. Following receipt of a notice which rejects a plan, the Contractor shall promptly submit a revised handover plan to the Engineer. The handover plan accepted by the Engineer shall be referred to herein as the ***Handover Plan***.

5.16A.4 The Contractor must comply with the Handover Plan and provide its reasonable assistance to the Principal so as to prevent, limit or mitigate any harm or disruption to the normal operation and maintenance of the Assets and the business of the Principal.

5.16A.5 If the Contract is terminated by the Principal, the Contractor shall, if so required by the Principal, continue to carry out the Contract Works for a period specified by the Principal but

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not exceeding 180 days from the date the Contract is terminated. During such period, the Principal shall continue to act in all respects in accordance with the Contract as if it had not been terminated and the Contractor's obligations had continued during such period. The Principal shall pay the Contractor during such period the same amount as would have fallen due during such period if the Contract had not been terminated. For the avoidance of any doubt, in the event the Principal terminates the Contract under Section 20, its obligation under 20.1.2 to provide 180 days' written notice shall apply.

5.16A.6 The Contractor shall deliver the Assets up to the Principal on the Date of Expiry or any termination date in such state and condition as shall be expected on the assumption that the Assets have been consistently managed, operated and maintained in accordance with the Contract.

5.17 Safety plan

Add the following to the end of 5.17.4:

The Contractor must comply with the current Engineer accepted Contract-specific safety plan.

5.18 Quality plan

Add the following to the end of 5.18.4:

The Contractor must comply with the current Engineer accepted quality plan.

5.19 Traffic management plan

Add the following to the end of 5.19.4:

The Contractor must comply with the current Engineer accepted traffic management plan.

5.20 As-built drawings, manuals, and maintenance records

5.20.3 The first sentence of 5.20.3(a) is deleted and replaced as follows:

Within 15 Working Days following completion of any Capital Works Services, or any other Variation (if required to provide as-built drawings, manuals or records under 5.20.1(a), 5.20.1(b) or 5.20.1(c), Schedule 1), the Contractor shall submit to the Engineer the draft as-built drawings, manuals and records for the Capital Works Services or Variation (where applicable).

6 ENGINEER'S POWERS AND RESPONSIBILITIES

6.1 Appointment of Engineer

6.1.1 Deleted and replaced as follows:

The Principal shall ensure that at all times there is an Engineer, and the Principal shall require the Engineer to fulfil all aspects of the role and functions reasonably and in good faith.

6.3 Engineer's Representative

6.3.2 Delete the last sentence and replace with the following:

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The Engineer shall, acting reasonably, consider such notice and shall either act on the notice and appoint another competent natural person in place of the person about whom the objection has been made, or inform the Contractor that it does not intend on replacing the Engineer's Representative and provide the Contractor the reasons why the Engineer does not agree with the Contractor's objection and the mitigation that the Engineer proposes to take to address the Contractor's concerns.

6.6 Certification

6.6.3 Deleted and replaced as follows:

The Engineer may by any Payment Schedule or any other certificate, correct an amount previously certified by the Engineer in a previous Payment Schedule, or correct any other certificate, which has been issued by him or her or by any previous Engineer, provided he or she notifies the Contractor in writing of his or her reasons for so doing.

6.7 Suspension of work

6.7.4 The following new last sentence is inserted:

This 6.7.4 will not apply where the suspension is due to default on the part of the Contractor.

6.8 Engineer may instruct urgent work

Insert a new 6.8.1(d) as follows

non-conformance with the Performance Indicators, as detailed in section 6 of the Specifications

7 INDEMNITY

7.1 Indemnity

Replace clause 7.1.1 as follows:

7.1.1 Except as otherwise provided in the Contract the Contractor will indemnify the Principal against:

(a) Any direct loss suffered by the Principal to the extent arising from the carrying out of, or remedying defects in, the Contract Works;

(b) Any liability incurred by the Principal in respect of injuries to Persons or damage to property to the extent arising from the carrying out of, or remedying of defects in the Contract Works; and

(c) Any Costs the Principal may incur in respect of that loss or liability.

Add new subclause as follows:

7.1.1(d) To the extent permitted by law, any loss (including solicitor/client legal costs) or liability incurred by the Principal in respect of any proceedings or action taken against the Principal for failure by the Contractor to comply with the provisions of any statute, regulation, bylaw or

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other requirement of government, local or public authority that may be applicable to the Contract Works.

Replace clause 7.1.3 as follows:

7.1.3 The Principal shall indemnify the Contractor against any direct loss suffered by the Contractor or liability incurred by it in respect of any of the matters referred to in paragraphs (a) and (b) of 7.1.2 and any Cost it may incur in respect of any such direct loss or liability.

7.2 Exclusion of liability for economic loss

Insert a new 7.2 as follows:

7.2 Exclusion of liability for economic loss

Neither party shall be liable to the other party (whether based on contract, infringement, negligence, strict liability, tort or otherwise) for any loss of profit or revenue, loss of production or down time costs, loss of opportunity, loss of contract, loss of goodwill, or the cost of obtaining any new financing or maintaining any existing financing nor for any indirect or consequential loss or damage in relation to the Contract, provided always that this 7.2 shall not prevent, limit or exclude:

(a) a party's liability in the case of fraud, Wilful Misconduct or gross negligence;

(b) the Contractor's liability to pay any liquidated or specified amounts under the Contract;

(c) the Contractor's liability to indemnify the Principal under 5.12.2,; and/or

(d) the liability of a party to the extent of amounts received (or, but for an act or omission of that party or any person for whom it is responsible, would have been received) by the party in respect of such liability pursuant to any of the insurance policies required to be effected and maintained in accordance with the Contract.

For the avoidance of any doubt, this 7.2 shall not exclude the Principal's liability to pay the Contract Price in accordance with the Contract.

8 INSURANCE

8.1 General

8.1.2 The phrase ", without the prior approval of the other insured parties" is deleted.

8.1.3 Deleted and replaced as follows:

(a) The Contractor shall, for the policies effected by it, comply with all warranties and conditions of cover of the policy and shall not engage in any practice or activity which could void the insurance cover.

(b) The Principal shall, for the policies effected by it, comply with all warranties and conditions of cover of the policy and shall not engage in any practice or activity which could void the insurance cover.

8.2 Contractor arranged insurances – General

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8.2.1 Deleted and replaced as follows:

The insurances for which the Contractor is responsible under the Special Conditions, Schedule 1 shall:

(a) be effected with insurers holding a credit rating of Standard & Poors A- (or equivalent) or better; and

(b) be in effect prior to the commencement of the Contract Works.

In addition, the Contractor will ensure that all other insurances as may be required by it or any Subcontractor under any Act or Regulation from time to time are effected (prior to the commencement of the Contract Works or, if later, the date from which the obligation to hold the relevant insurance arises) and maintained up to the issue of the Final Completion Certificate for the Contract Works.

8.2.3 Insert new 8.2.3(c) and 8.2.3(d) as follows:

(c) the actions of one insured will not affect the rights of any other insured;

(d) the policies are primary and without contribution from any policy of insurance effected by the Principal.

8.2.7 The words "or relevant extracts thereof" are inserted after the words "policy or policies".

8.2.8 A new last sentence is inserted as follows:

Nothing in this 8.2.8 will limit the liability of the Contractor to the Principal, should the Principal fail for any reason whatsoever to pay any insurance premium under this 8.2.8.

8.5 Contractor arranged public liability insurance

8.5.1 Deleted and replaced as follows:

Where the Contractor is identified in the Special Conditions as being the party responsible to effect public liability insurance, the Contractor will, without limiting its obligations under 5.6 and 7.1, effect public liability insurance for an amount not less than that stated in the Special Conditions, to indemnify the Contractor against legal liability to third parties for damage, loss, or injury caused by any act or omission of the Contractor arising out of the performance of the Contract Works. The insurance shall also cover for:

(a) The Contractor's legal liability arising out of the performance of the Contract Works for damage, loss, or injury to the Principal and to the Principal's property, other than to the Contract Works and existing property to be insured under 8.3 or 8.8;

(b) Liability arising out of vibration, weakening, or removal of support; and

(c) Liability under the Forest and Rural Fires Act.

The Principal's existing structures must be treated as third party property by the Contractor's public liability policy.

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9 VARIATIONS

9.1 Variations permitted

9.1.1 Make the following amendments:

Add to the end of 9.1.1(b):

regardless of whether or not any such work omitted is subsequently carried out by a Separate Contractor or by the Principal itself.

Delete "or" at the end of 9.1.1(d)

Delete "." at the end of 9.1.1(e) and replace with "; and"

Insert a new 9.1.1(f) as follows:

Instructs the Contractor to carry out Capital Works Services (for the avoidance of any doubt, the Principal (and thus the Engineer) is not obliged to instruct any Capital Works Services).

9.1.6 Insert a new 9.1.6 as follows:

The parties agree that Asset Scope Instructions are dealt with under Section 16 and not this Section 9, except to the extent expressly set out in 16.3.3(a)(iii).

9.1A Contractor to provide information

Insert a new 9.1A as follows:

9.1A Contractor to provide information

9.1A.1 Following a request by the Engineer (which request for the avoidance of doubt is not an order for a Variation) in respect of a proposed or potential Variation, the Contractor shall promptly, at its cost, prepare and submit to the Engineer:

(a) a detailed and substantiated quotation for the proposed Variation which shall, to the extent applicable or appropriate, be based on the rates set out in the Schedule of Prices and submitted in the form required by the Engineer (for example, as a fixed price lump sum); and

(b) where required by the Engineer, a programme setting out the proposed date for completion of the Variation (the ***Proposed Time for Completion of the Variation***).

9.1A.2 The Engineer shall take into account the information submitted by the Contractor under 9.1A.1 in determining the value of the relevant Variation should an actual Variation proceed.

9.1A.3 In the event the Principal decides, in its sole and absolute discretion, to accept a fixed price lump sum quotation submitted by the Contractor under 9.1A.1, the Contract Price shall be adjusted accordingly, the provisions of 9.3 shall not apply, and, notwithstanding anything to the contrary, the Contractor will be paid the fixed price lump sum amount for the Variation.

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9.2 Variation orders

9.2.1 Deleted and replaced as follows:

(a) The Contractor shall not vary the Contract Works without an order in writing from the Engineer.

(b) The Contractor shall not commence any Variation until such time as it has:

(i) submitted the relevant information to the Engineer in accordance with 9.1A.1 (even where the Engineer may not have requested that information); and

(ii) subsequently received a written notice to proceed from the Engineer.

9.2.2 The words "1 Month or as soon as practicable thereafter" are deleted and are replaced with "20 Working Days of the instruction", and the following is inserted at the end:

and the notice must expressly refer to this 9.2.2. Full compliance with the foregoing is a condition precedent to having the matter treated as a Variation, and this 9.2.2 is without limitation or prejudice to 5.21.

9.2.3 Deleted and replaced as follows:

Where under the Contract the Contractor is given an express entitlement to claim a Variation or where it is stated that a matter will be determined or treated "as if a Variation" (or where similar language is used), the Contractor shall within 20 Working Days of the matter first arising give written notice to the Engineer to that effect and the notice must expressly refer to this 9.2.3. Full compliance with the foregoing is a condition precedent to having the matter treated as a Variation, and this 9.2.3 is without limitation or prejudice to 5.21.

9.5 Unforeseen physical conditions

9.5.1 The words "unless those conditions occur as a result of weather away from the Site" are deleted.

10 CONTRACT WORKS PERIOD

10.2 Date of Expiry

Deleted and replaced as follows:

The Date of Expiry of the Contract Works Period for the Contract Works shall be the date provided in the Special Conditions, as such date may be expressly adjusted under the Contract.

10.2A Date of Expiry of the Transfer Station Works

A new 10.2A is inserted as follows:

10.2A Date of Expiry of the Transfer Station Works

10.2A.1 In the event the Principal, in its sole and absolute discretion, requires the Contractor to continue performing the Transfer Station Works after the Date of Expiry set out at 10.2(b)

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Schedule 1, it may notify the Contractor in writing 20 Working Days prior to the date that is 2 years from the Date of Commencement.

10.2A.2 If the Contractor receives notice under 10.2A.1, the Date of Expiry set out at 10.2(b) Schedule 1 will be extended and shall be deemed to rollover on a month-by-month basis until the Principal provides the Contractor with 10 Working Days' notice in writing that the Contractor is no longer required to carry out the Transfer Station Works.

10.2A.3 Notwithstanding the foregoing, the Transfer Station Works will not extend beyond the Expiry Date Cap.

11 DEFECTS LIABILITY

11.1 Remedying of defects

11.1.1 Deleted and replaced as follows:

The Contractor shall, prior to the Date of Expiry of the Contract Works Period, remedy any defects and damage in the Contract Works and/or the Assets resulting from defective workmanship or Materials, or any other defective performance of the Contractor, including any such defects or damage notified to the Contractor by the Engineer prior to the Date of Expiry of the Contract Works Period. The Contractor shall remedy any such defects or damage within 5 Working Days of receipt of the Engineer's notice or within such other reasonable time as agreed by the Engineer in writing.

11.1.2 Delete the words "promptly and" in the first sentence.

11.2 Searching for defects

11.2.1 Deleted and replaced as follows:

The Engineer may direct the Contractor to search for any defect in the Contract Works or an Asset to which 11.1.1 applies prior to the Date of Expiry of the Contract Works Period. Unless the defect is one which the Contractor is liable to remedy under 11.1 (in which case the search and remedial works shall be at the Contractor's cost), the search and any remedial work shall be treated as a Variation.

11.4 Final Completion Certificate

11.4.2 Make the following amendments:

Delete "and" at the end of 11.4.2(b).

Delete "." at the end of 11.4.2(c) and replace with "; and"

Insert a new 11.4.2(d) as follows:

11.7 Guarantees

11.7.2 Deleted and replaced as follows:

Each such guarantee shall be submitted to the Engineer as soon as practicable after the Engineer notifies the Contractor of the requirement for the guarantee and receipt by the Engineer of a duly executed guarantee shall be a condition precedent to the Principal's

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obligation to make any payment to the Contractor in respect of the applicable subcontract works following the Engineer's said notice.

11.7.4 Insert a new 11.7.4 as follows:

The Principal agrees, in favour of each relevant Subcontractor, that notwithstanding the Principal is not intended to be a party to the form of continuity guarantee set out in Schedule 17, the Principal will nevertheless be bound by the agreement to arbitrate contained in clauses 3.2 and 3.3 of the form of continuity guarantee.

12 PAYMENTS

12.1 Contractor's payment claims

12.1.3(b) Deleted and replaced as follows

Identify the Contract Works or, where applicable, the Broader Outcomes Works, to which the payment claim relates, the claimed amount in respect of those Contract Works, or, where applicable, the Broader Outcomes Works, and the manner in which the claimed amount has been calculated, in particular:

(i) for Contract Works excluding Variations and Asset Scope Instructions, the agreed rates set out in the Schedule of Prices multiplied by actual quantities;

(ii) the amount claimed for Variations;

(iii) the amount claimed for Asset Scope Instructions;

(iv) any Performance Bonus Payment that may be payable; and

(iv) any amount claimed for any other amounts to which the Contractor is expressly entitled to under the Contract.

12.1.3(c) Deleted and replaced as follows:

Indicate the due date for payment which shall be the date required under 12.2.8.

12.2 Progress Payment Schedules

12.2.8 Deleted and replaced as follows:

The scheduled amount under 12.2.2(d) or 12.2.5(d) as the case may be, together with (where appropriate) the amount of good and services tax payable will be paid by the Principal to the Contractor by the 20th day of the Month following the Month in which the Contractor's proper payment claim was served on the Engineer under 12.1.1.

12.7 Interest

12.7.4 Deleted and replaced as follows:

The rate of interest will be equal to 2% above the New Zealand 90 day bank bill buy rate at the time of the payment default.

12.9 Provisional Sums

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12.9.4 Insert a new 12.9.4 as follows:

Notwithstanding anything to the contrary, nothing in this 12.9 applies in respect of the Innovation Fund Cap and the Broader Outcomes and Innovation regime generally. For the avoidance of any doubt, the Innovation Fund Cap may only be applied in accordance with the regime under Section 22 (Broader Outcomes and Innovation).

12.14 Performance payments

12.14.1 –
12.14.2 Deleted and replaced as follows:

12.14.1 A Performance Bonus Payment shall be paid by the Principal to the Contractor, as an adjustment to the Contract Price in the event the Contractor's actual performance is equal to or exceeds the Performance Indicators, such Performance Bonus Payment to be calculated in accordance with section 6 of the Specifications.

12.14.2 For the avoidance of any doubt, the Contractor shall not be entitled to a Performance Bonus Payment under 12.14.1, if the Contractor has been issued demerit points exceeding the thresholds as particularised in Section 6 of the Specifications.

12.14A Performance incentives – extension to the Contract Works Period

A new 12.14A is inserted as follows:

12.14A Performance incentives – extension to the Contract Works Period

12.14A.1 The Contractor may be eligible for two 2-year extensions to the Contract Works Period under this 12.14A. The maximum Date of Expiry is midnight on 1 February 2037 (***Expiry Date Cap***).

12.14A.2 On the date falling 9.5 years from the Date of Commencement or on the next Working Day following such date, the Governance Group shall meet to consider whether the Contractor will be entitled to a 2-year extension to the Contract Works Period.

12.14A.3 In the event the Contract Works Period is extended under 12.14A.2, the Governance Group shall meet on the date falling 2 years following the previous extension meeting or on the next Working Day following such date. The Governance Group will consider whether the Contractor

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will be entitled to a further 2 year extension to the Contract Works Period (noting that the Contract Works Period will not extend beyond the Expiry Date Cap).

12.14A.4 In considering whether the Contractor is entitled to a 2 year extension to the Contract Works Period, the Governance Group will have regard to (as from the Date of Commencement):

(a) the Contractor's performance against the performance indicators set out in the Specifications;

(b) the extent to which the Contractor has been issued any demerit points;

(c) the Contractor's rectification of any non-conformance with the performance indicators set out in the Specifications;

(d) the Contractor's compliance against its obligations under Schedule 19; and

(e) any other matters which the Governance Group considers to be relevant.

12.14A.5 In the event the Governance Group unanimously determines that the Contractor is entitled to a 2-year extension to the Contract Works Period, the Principal shall promptly confirm this in writing to the Contractor in which case the Contract Works Period and Date of Expiry will be deemed to have been amended accordingly.

12.14A.6 In the event the Governance Group does not unanimously determine that the Contractor is entitled to a 2-year extension to the Contract Works Period, then the Contractor will not be entitled to the extension, provided however that the Principal may nevertheless, in its sole and absolute discretion, grant the Contractor the extension in which case the Principal shall promptly confirm this in writing to the Contractor and the Contract Works Period and Date of Expiry will be deemed to have been amended accordingly. In order for such written notice to be effective, the notice must be signed by a duly authorised representative of the Principal and specifically refer to this 12.14A.6.

12.14A.7 In the event that:

(a) the Contract Works Period is extended under 12.14A.5 or 12.14A.6; and

(b) subsequent to the Principal's written confirmation to the Contractor under 12.12A.5 or 12.14A.6, the Engineer or the Principal identifies that the Contractor has failed to meet one or more of the performance indicators set out in the Specifications (irrespective of whether the Engineer has issued demerit points in respect of the same),

the Governance Group will meet again to reconsider whether the 2-year extension shall still apply. The 2-year extension will only still apply if the Governance Group unanimously determines in writing that it should still so apply, unless the Principal, in its sole and absolute discretion, requires the extension to apply in which case it will still apply and the Principal will confirm this in writing to the Contractor. In order for such written notice to be effective, the notice must be signed by a duly authorised representative of the Principal and specifically refer to this 12.14A.7.

12.14A.8 The rights and remedies of the Principal under the Contract are cumulative of one another and a right or remedy of the Principal under the Contract will not be construed to limit or prejudice any other right or remedy of the Principal under the Contract. Accordingly, and without limitation, the rights and remedies of the Principal under clause 11 are in addition to

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the rights and remedies of the Principal under this 12.14A, and 12.14A will not be construed to limit or prejudice the Principal's rights under clause 11.

12.16 Set-off

Insert a new 12.16 as follows:

12.16 Set-off

The Principal is entitled to set-off, deduct or withhold against and from any sums that would otherwise be due to the Contractor amounts in respect of any genuine claims it may have against the Contractor in relation to or in connection with the Contract or the Contract Works, including damages for breach of contract by the Contractor, liquidated damages (including KPI deductions), omissions or defects or under any indemnities. This right of set-off, deduction and withholding is without prejudice to any other right of set-off, deduction or withholding provided for pursuant to the Contract or otherwise.

12.17 Taxes

Insert a new 12.17 as follows:

12.17 Taxes

12.17.1 The Contractor, as between the Contractor and the Principal, assumes responsibility for, is liable for payment of, and warrants that it will pay, or ensure the payment of, all taxes, levies, duties, withholdings and other imposts of every kind and nature whatsoever assessed on the Contractor, any Subcontractors, or their employees or agents in relation to Materials, Plant and the Contract Works, or as otherwise may be assessed as a consequence of the performance of the Contractor's obligations under the Contract.

12.17.2 The Principal may make (in addition to any other set-offs, deductions or withholdings permitted by the Contract) any deductions or withholdings from any payments to the Contractor to the extent that it is required to do so by law. The Principal will not be liable for grossing-up payments to the Contractor in respect of any such deductions or withholdings.

12.17.3 The Contractor must immediately notify the Principal in writing of any change in the Contractor's income tax status. In the event that the Contractor fails to so notify the Principal of a change in the Contractor's income tax status and the New Zealand Inland Revenue Department imposes withholding taxes, fines, penalties or other costs on the Principal, the Contractor will pay such withholding taxes, fines, penalties or other costs immediately on demand by the Principal as a debt due and payable.

12.17.4 For the avoidance of doubt, full allowance for all such matters has been made by the Contractor in the rates in the Schedule of Prices.

13 DISPUTES

13.4 Arbitration

13.4.3 The following is inserted at the end:

The place (and seat) of arbitration will be Wellington in New Zealand or such other place in New Zealand nominated by the Principal.

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13.8 Injunctive or urgent relief

A new 13.8 is inserted as follows:

13.8 Injunctive or urgent relief

Nothing in this Section 13 prejudices either party's right to institute court proceedings to seek injunctive or urgent declaratory relief in respect of any dispute or difference.

14 FRUSTRATION AND DEFAULT

14.2 Default by the Contractor

14.2.1 Deleted and replaced as follows:

The Principal may at its option either terminate the Contract or resume exclusive occupancy of the Site in the event of:

(a) the Contractor failing to provide the Contractor's Bond in accordance with 3.1.2 or any replacement Contractor's Bond in accordance with 3.1.2 or 3.1.3;

(b) the Contractor subcontracting the whole or substantially the whole of the Contract Works without the consent in writing of the Principal or the Contractor assigning, charging or novating any of its rights and/or obligations under the Contract or purporting to do the same without the consent in writing of the Principal;

(c) the Engineer certifying in writing to the Principal that in his or her opinion the Contractor:

(i) has abandoned the Contract; or

(ii) is in material breach of the Contract; or

(iii) has failed to commence the Contract Works in accordance with clause 10.1.2; or

(iv) is persistently, flagrantly or wilfully neglecting to carry out its obligations under the Contract;

(e) the Contractor failing to comply with any of its health, safety and/or environmental obligations under the Contract;

(f) the Contractor providing false information, supplying misleading information or suppressing the provision of material information at any time before the signing of the Contract by the Contractor; or

(g) the Engineer issuing 20 or more demerit points (in accordance with section 6 of the Specifications) in any 3 month rolling period throughout the Contract Works Period,

and the Contractor's default has not been remedied to the satisfaction of the Principal within 10 Working Days of receiving notice of the default from the Engineer or the Principal, provided that no such cure period applies in respect of the grounds in 14.2.1(b), (f) or (g) with the effect and intent that the Principal can either terminate the Contract or resume exclusive occupancy of the Site immediately upon giving notice to the Contractor.

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14.2.2 Deleted and replaced as follows:

In the event of an Insolvency Event occurring in relation to the Contractor the Principal may at its option by notice in writing to the Contractor either terminate the Contract or resume exclusive occupancy of the Site.

14.2.6-
14.2.7 Insert new 14.2.6 – 14.2.7 as follows:

14.2.6 Without limitation or prejudice to the above provisions of this 14.2, the following will apply where the Principal resumes exclusive occupancy of the Site or terminates the Contract under 14.2.1 or 14.2.2:

(a) the Contractor will, to the extent required by the Principal, assign to the Principal all of its rights and benefits under its subcontracts within 10 Working Days of being requested to do the same;

(b) the Contractor will co-operate with the Engineer in the transfer of information and disposition of work in progress so as to mitigate the cost to the Principal of removing the Contractor;

(c) the Contractor will comply with all other reasonable requests from the Engineer regarding the terminated works and co-operate with and provide all reasonable assistance to the successor contractor (if any) and/or the Principal following the removal of the Contractor to ensure that there is a smooth and efficient handover of the Contract Works to any successor contractor and/or the Principal as the case may be;

(d) if so required by the Principal, the Contractor will comply with its obligations under 5.16A.5;

(e) the Contractor will comply with 5.16A.6; and

(f) the Principal may pay any Subcontractor for any Materials delivered or works or services executed for the purpose of the Contract (whether before or after the date of resumption or termination) insofar as the price thereof has not already been paid by the Contractor, and any such payments may be deducted from any sums due or to become due to the Contractor.

14.2.7 Where the Principal resumes exclusive occupancy of the Site or terminates the Contract under 14.2.1 or 14.2.2, the Principal may:

(a) withhold further payments to the Contractor until all amounts that may become owing to the Principal by the Contractor as a result of the Contractor being removed are known; and

(b) require the Engineer, once the Principal has made a provisional election of its remedies, to make a provisional assessment of all amounts that may become owing to the Principal by the Contractor as a result of the Contractor being removed based on the Principal's provisionally elected remedies, and that amount will be a sum immediately due and payable from the Contractor to the Principal and the Principal may immediately recover such amount from the Contractor and/or by making a call on the Contractor's Bond and/or on any other security.

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Any amount paid by the Contractor to the Principal under 14.2.7(b) will be taken into account by the Engineer when certifying under 14.2.4.

15 SERVICE OF NOTICES

15.1 General

15.1.2(b) Deleted and replaced as follows:

(b) sent by email or other means of electronic communication permitted by the Special Conditions, Schedule 1 to their address as stated in the Contract or as subsequently advised in writing, in which case such service will take effect when the receipt is acknowledged by the receiver by return email or otherwise in writing, except that return emails generated automatically will not constitute an acknowledgement.

16 ASSET SCOPE INSTRUCTIONS

Insert a new Section 16 as follows:

16.1 New Assets

16.1.1 The Contractor acknowledges that the Principal may, during the Contract Works Period, instruct the Contractor to incorporate new assets within the scope of the Contract Works (such assets referred to herein as ***New Assets***).

16.2 Removal of Assets

The Principal may, from time to time during the Contract Works Period, instruct the Contractor in writing to remove existing Assets under the Contract from the scope of the Contract Works.

16.3 Asset Scope Instructions and Contract Price

16.3.1 An instruction issued by the Principal under 16.1 or 16.2 shall be referred to as an ***Asset Scope Instruction***.

16.3.2 In the event the Principal issues an Asset Scope Instruction to the Contractor, the scope of the Contract Works will be deemed to have been modified accordingly.

16.3.3 The Contractor acknowledges and agrees that an Asset Scope Instruction:

(a) which adds a New Asset to the scope of the Contract Works will:

(i) mean the Contractor must promptly (subject to the following sentence in this 16.3.3(a)(i)) provide a detailed and substantiated fixed price lump sum for the Principal's consideration in respect of the Asset Scope Instruction. The Principal shall provide the Contractor with reasonable access and opportunity to inspect such New Asset for the purpose of developing a detailed and substantiated fixed price lump sum for such Asset Scope Instruction;

(ii) to the extent the Principal accepts a fixed price lump sum, be carried out on a fixed price lump sum basis, in which case such Asset Scope Instruction to the extent it is compensated on a fixed price lump sum basis will not be taken into account in setting the Target Cost for the next Contract Year and

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subsequent Contract Years on the basis that the fixed price lump sum is full compensation; and

(iii) to the extent the Principal does not accept a fixed price lump sum proposed by the Contractor, be valued under 9.3 for the remainder of the current Contract Year, provided that in the following Contract Year and each subsequent Contract Year the Asset Scope Instruction will be factored in and taken into account in the Agreed Target Cost and Contract Works Programme for the next and subsequent Contract Years, with the intent and effect that such Asset Scope Instruction will ultimately be subject to the target cost regime (except where it occurs in the last Contract Year).

(b) which removes an Asset from the scope of the Contract Works will:

(i) result in a cost adjustment of the Schedule of Prices in accordance with the Conditions of Contract

and in the following Contract Year and each subsequent Contract Year the Asset Scope Instruction will be factored in and taken into account in the Cost and Contract Works Programme for the next and subsequent Contract Years.

17 COMPLIANCE AND PERFORMANCE MEASUREMENT

Insert a new Section 17 as follows:

17.1 Performance measurement

17.1.1 The Contractor's performance will be subject to the compliance and performance measurement regime set out in section 6 of the Specifications. The Engineer will assess the Contractor's performance against such regime for the purpose of determining whether the Contractor is entitled to a Performance Bonus Payment.

17.1.2 The Contractor shall comply with the Performance Indicators throughout the Contract Works Period.

17.1.3 The Engineer may, at any time, carry out performance and quality inspections of the Contract Works for the purpose of assessing whether the Contractor is complying with the Performance Indicators and the Contractor will provide reasonable assistance to the Engineer to enable him or her to carry out such inspections.

17.1.4 If the Engineer determines that the Contractor is not complying with one or more of the Performances Indicators, the Engineer may notify the Contractor in writing that its performance has incurred demerit points, on the basis set out in Section 6 of the Specifications.

17.1.6 The Engineer may instruct the Contractor to rectify any failings or inadequacies in order to address a failure to comply with or achieve Performance Indicators whether or not the Engineer has issued demerit points in respect of the same. The Contractor will promptly comply with such instruction at its own Cost and 6.8.2, 6.8.3 and 6.8.4 shall apply in this regard.

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17.2 Principal's rights and remedies cumulative

17.2.1 The rights and remedies of the Principal under the Contract are cumulative of one another and a right or remedy of the Principal under the Contract will not be construed to limit or prejudice any other right or remedy of the Principal under the Contract.

17.2.2 Accordingly, and without limitation, the rights and remedies of the Principal under 6.5 and Section 11 are in addition to the rights and remedies of the Principal under Section 17, and Section 17 will not be construed to limit or prejudice the Principal's rights and remedies under 6.5 and Section 11.

18 PARTNERING VALUES AND GOVERNANCE GROUP

Insert a new Section 18 as follows:

18.1 The parties affirm and will apply the partnering values set out in Schedule 19.

18.2 The parties will, within 10 Working Days following the Date of Commencement, establish the Governance Group which will comprise of:

(a) a representative of the Principal;

(b) a representative of the Contractor;

(c) the Engineer; and

(d) any other persons as agreed between the parties from time to time.

18.3 In addition to its obligations under 12.14A, the Governance Group will:

(a) meet at least 3 monthly to review the Project progress, discuss issues, reinforce the demonstration of the partnering values (as set out in Schedule 19) by the parties, and monitor the identification and resolution of risks and opportunities; and

(b) review performance against Key Result Areas; and

(c) review use of innovation fund (refer to section 7 of the Specification).

19 CONFIDENTIALITY

Insert a new Section 19 as follows:

19.1 Confidential Information

The Contractor will at all times (including after the termination or expiry of the Contract) keep confidential:

(a) the subject matter, and the terms and conditions, of the Contract;

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(b) information acquired by the Contractor in anticipation of, or in connection with, the performance of the Contract in circumstances that can reasonably be taken to indicate such information is confidential;

(c) any other information obtained directly or indirectly from or on behalf of the Principal or the Engineer under or in connection with the Contract, including any information relating to the financial position or business of the Principal or the Engineer; and

(d) any claim, dispute or difference in relation to or in connection with the Contract,

(being, ***Confidential Information***) except to the extent:

(e) that the Contractor has the express prior written consent of the Principal or the Engineer, as may be appropriate;

(f) that disclosure is made to a professional advisor of the Contractor provided that the Contractor informs the advisor of the confidential nature of the information and the advisor unconditionally and irrevocably agrees in writing to keep the information confidential (such written agreement must be obtained prior to disclosure being made);

(g) the information becomes generally known to the public without fault on the part of the Contractor;

(h) the information is required to be provided to the Contractor's officers, employees, agents or Subcontractors to perform the Contract Works, provided that the Contractor informs the Person of the confidential nature of the information and the Person unconditionally and irrevocably agrees in writing to keep the information confidential (such written agreement must be obtained prior to disclosure being made);

(i) the Contractor is required to disclose such information as required by any recognised stock exchange; or

(j) the Contractor has a statutory obligation to disclose such information or is required to make such disclosure by a court of law.

19.2 Compelled disclosure

If the Contractor is required to disclose any matter or information covered by 19.1(i) or 19.1(j), the Contractor will use its reasonable endeavours to obtain undertakings that confidential treatment will be accorded to the information by the Person to whom it is disclosed.

19.3 Subcontracts

The Contractor must ensure that its Subcontractors are bound by confidentiality undertakings equivalent to this Section 19.

19.4 Media statements

The Contractor will not make any statements to the media or others regarding the contents of the Contract or the execution of the Contract Works without the prior written approval of the

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Principal. Media requests for information relating to the Contract Works or the Principal's assets or its business will be immediately referred by the Contractor to the Principal.

19.5 Local Government Official Information and Meetings Act

19.5.1 The Contractor acknowledge that the Principal is subject to the Local Government Official Information and Meetings Act 1987 (the ***LGOIMA***), and that pursuant to a request made under the LGOIMA, the Principal may disclose information relating to or arising out of the Contract Works, the Contractor or the Contract to the requestor.

19.5.2 The Contractor will immediately refer to the Principal for response any request made by a third party for information about the Contract Works or the Contract, regardless of whether or not the request to the Contractor is stated to be made under the LGOIMA.

19.5.3 The Contractor will provide assistance and information to the Principal promptly upon request in order to enable the Principal to comply with any statutory obligations or internal business obligations insofar as they relate to the Contract (including, without limitation, the Principals obligations under the LGOIMA).

20 GENERAL

Insert a new Section 20 as follows:

20.1 Independent Contractor

20.1.1 The Contractor is an independent contractor performing the Contract. Nothing in the Contract will create, constitute or evidence any partnership, joint venture, agency, trust or employer/employee relationship between the parties, and no party may make, or allow to be made, any representation that any such relationship exists between the parties. No party will have the authority to act for, or incur any obligation on behalf of, the other party.

20.1.2 The Contractor assumes responsibility for the manner in which the Contract Works are performed. All employees and representatives of the Contractor and any Subcontractors will be under the complete control of the Contractor and will not be deemed to be employees of the Principal, and (without limiting 14.2.6(a) nor any guarantees or warranties that the Principal may obtain from any Subcontractors) nothing contained in the Contract or in any subcontract will be construed to create any contractual relationship between the Principal and any such employees, representatives or any Subcontractors.

20.2 Severability

If any one or more of the provisions contained in the Contract is invalid, illegal or unenforceable in any respect under any applicable Act or Regulation, the validity, legality and enforceability of the remaining provisions contained in the Contract will not in any way be affected or impaired.

20.3 Amendments

No amendment to the Contract will be binding on the parties unless in writing and signed by an officer or representative of each party having the authority to do so.

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20.4 Counterparts

The Contract may be executed in any number of counterparts which, when taken together, shall constitute one instrument.

20.5 Contractor's representations and warranties

20.5.1 The Contractor makes the following continuing representations and warranties for the benefit of the Principal:

(a) the Contract Price for each Contract Year is, and will be, sufficient to cover the performance of all of its obligations and duties under and in relation to and in connection with the Contract and all things and matters required for the due, proper and punctual performance and completion of the Contract Works in accordance with the Contract during the relevant Contract Year (excluding Variations and Asset Scope Instructions);

(b) it is not entitled to and will not claim any extension of the Contract Works Period, any Variation, any additional compensation or any other relief whatsoever under, in relation to or in connection with the Contract except to the extent expressly set out in the Contract, and it will not claim otherwise, provided however that this 20.5.1(b) will not fetter any right of the Contractor to pursue the Principal at law for breach of contract, negligence or fraud and nor will it fetter any rights of the Contractor under the Construction Contracts Act 2002;

(c) it has satisfied itself with all aspects of the Site and the Assets, including any rights, easements, reservations, stipulations or other matters affecting the Site or the Assets;

(d) it has carefully reviewed and understands all of the requirements of the Contract, and has determined that it is fully able to conduct, perform, and complete the Contract Works in accordance with the Contract;

(e) it will not engage in any conduct which is misleading or deceptive or likely to mislead or deceive; and

(f) it has or will obtain all required approvals, licences, professional ability, skills, capacity and financial resources to perform its obligations in accordance with the requirements contained in the Contract.

20.6 Probity

20.6.1 It is essential that the Contractor always acts in its dealings with the Principal, its officers, employees, advisers, contractors and agents in a manner consistent with the highest standards of probity.

20.6.2 The Contractor must, if required by the Principal, comply with any probity guidelines and principles promulgated by or on behalf of the Principal from time to time, and must ensure that all Subcontractors do the same.

20.6.3 The Contractor:

(a) must not commit any Prohibited Practice; and

(b) must ensure that no Subcontractor commits any Prohibited Practice,

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at any time (including both before and after the date of the Contract Agreement).

20.6.4 Notwithstanding anything to the contrary, any failure by the Contractor to comply with the foregoing provisions of this 20.6 will entitle the Principal to terminate the Contract with immediate effect by giving written notice to the Contractor to that effect. 14.2.5, 14.2.6 and 14.2.7 will apply to any such termination, as if the Principal had terminated the Contract under 14.2.1. Any such termination will be without limitation or prejudice to any other rights or remedies of the Principal, and the Contractor shall not be entitled under contract, at tort or otherwise to any loss, costs or expenses in relation to or in connection with the termination.

20.6.5 The Principal does not and will not at any time tolerate any Prohibited Practices, whether committed by the Contractor or any Subcontractor. The Principal reserves the right to pursue the Contractor to the full extent permitted by law in the event that any such Prohibited Practice is committed or is alleged to have been committed, and may (notwithstanding anything to the contrary) make any public announcement(s) in respect thereof, including naming the Contractor and/or any such Subcontractor in connection with the Prohibited Practice or alleged Prohibited Practice.

20.7 Conflicts of interest

20.7.1 The Contractor warrants to the best of its knowledge and belief that:

(a) at the Date of Acceptance of Tender and the date of signing the Contract Agreement no conflict of interest exists; and

(b) it will use its best endeavours to ensure that no conflict of interest is likely to arise or arises in relation to the performance of its obligations under the Contract.

20.7.2 If, during the term of the Contract, any such conflict of interest or risk of conflict of interest arises, the Contractor must immediately notify the Principal of that conflict or risk.

20.7.3 Failure by the Contractor to comply with the warranties and/or provisions of this 20.7, or where any such conflict or risk of conflict arises, then this will be regarded as a material breach of the Contract by the Contractor.

20.8 Regulatory position

20.8.1 The Contract does not bind the Principal in its capacity as regulatory authority. Any consent or agreement the Principal gives under the Contract is not an agreement or consent in its regulatory capacity and vice versa.

20.8.2 When acting in its regulatory capacity, the Principal is entitled to consider all applications to it without regard to the Contract. The Principal will not be liable to the Contractor if, in its regulatory capacity, the Principal declines or imposes conditions on, any licence (as defined in 5.11.2) or permission that the Contractor or anyone else seeks for any purpose associated with the Contract.

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20.9 Programmes and approvals

20.9.1 The observance by the Contractor of any programme, procedure, policy, manual, plan or similar instrument or tool referred to or derived or prepared under the Contract will not relieve the Contractor from any of its obligations, duties or liabilities under the Contract.

20.9.2 The obligations, duties and liabilities of the Contractor under the Contract will not be released, diminished or in any other way affected by any enquiry, direction, inspection, comment, consent, sanction, acknowledgement, confirmation, approval, disapproval, certification (including any Payment Schedule) or advice made or given by or on behalf of the Principal, the Engineer or any Engineer's Representative or failure by any such Person to enquire, direct, inspect, comment, consent, sanction, acknowledge, confirm, approve, disapprove, certify or advise, and nor does any of the foregoing constitute acceptance of any of the Contract Works.

21 FORCE MAJEURE

Insert a new Section 21 as follows:

21.1 Force Majeure

21.1.1 A Party shall not be bound to fulfil its obligations under the Contract to the extent it is prevented from performing due to Force Majeure but only for so long as the Force Majeure subsists.

21.1.2 In the event of Force Majeure, the affected Party shall take all reasonable measures available to promptly mitigate the effect of such Force Majeure and shall promptly notify the other Party in writing specifying the nature of the Force Majeure, the obligations which it is prevented from performing as a result of such Force Majeure and the actions it intends to take to promptly mitigate such Force Majeure.

22 BROADER OUTCOMES AND INNOVATION

Insert a new Section 22 as follows:

22.1 Broader Outcomes Proposals

22.1 From time to time, the Principal, or the Contractor, may propose to add, substitute or augment any additional works and/or, Plant or Materials, because such change is identified as beneficial, or likely to be beneficial, to one or more Key Result Areas and/or the Principal's Broader Outcomes and Innovation goals generally in which case (without limiting section 7 of the Specifications) the following provisions apply:

(a) The proposing party will, in writing to the other parties, set out the reasonable details of:

(i) its proposal to add, substitute or augment any additional works and/or services, Plant, Materials, or processes;

(ii) a description of the resulting benefits to one or more Key Result Areas and/or the Principal's Broader Outcome and Innovation goals generally, and the key performance indicators that would apply;

(iii) the known or reasonably estimated applicable costs (if any):

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(iv) the proposed basis and method of payment: and

(v) whether the proposal is BOI Viable, to the extent the proposing party is reasonably able to do so.

a "**Broader Outcomes Proposal".**

(b) Where the proposing party is the Principal, the Contractor must not unreasonably delay or withhold information needed by the Principal to prepare a Broader Outcomes Proposal.

(c) Where the proposing party is the Contractor, the Principal may within ten (10) Working Days of receipt, reject the Broader Outcomes Proposal in which case clauses 22.1(d), (e) and (f), 22.2 and 22.3 shall not apply.

(d) No later than twenty (20) Working Days following receipt of a Broader Outcomes Proposal, the parties will meet and discuss the Broader Outcomes Proposal, including its scope, specifications, key performance indicators, basis and method of payment and costs. Following such meeting:

(i) the Principal will, within ten (10) Working Days advise the Contractor in writing of any required revision (if any) to the Broader Outcomes Proposal (in consultation with the Contractor if requested by the Principal) including any update to the Specification and Key performance indicators; and

(ii) the Contractor will, within twenty (20) Working Days (unless otherwise agreed) develop the Broader Outcomes Proposal into a detailed plan that, to the extent reasonably practicable:

(A) complies with the requirements set out in section 7 of the Specifications; and

(B) sets out how the Broader Outcomes Proposal will be implemented by the Contractor taking into account any revision or update required by the Principal (if any) under 22.1(d)(i) above.

(e) No later than ten (10) Working Days following receipt of such detailed plan, the Principal will either, in its sole discretion, accept or reject such detailed plan. Where the Principal rejects a detailed plan, it may give its reasons for such rejection, following which the Contractor may within ten (10) Working Days, submit a revised plan to the Principal addressing such reasons. To the extent the Contractor does submit a revised plan, the process in this 22.1(e) will be repeated until a detailed plan is either rejected outright (without reasons) or accepted by the Principal.

(f) Where the Principal accepts a detailed plan (including any revision thereof), it will notify the Contractor of such acceptance and the accepted detailed plan will become a ***Broader Outcomes Plan***.

(g) Notwithstanding anything to the contrary, if at any time the Contractor considers part of a Broader Outcomes Plan is or has become BOI Viable, then the Contractor

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must promptly advise the Engineer in writing, and no pricing adjustment will apply to the Broader Outcomes Proposal or relevant part.

(h) Where either party requests, a BOI Test under clause 22.3, the timeframes in this clause 22.2 will not apply until such BOI Test is completed or the Principal has instructed the Contractor to end the BOI Test under clause 22.3(c).

22.2 Implementing Broader Outcomes Plan

(a) Following the Principal notifying its acceptance under 22.1(f), the Contractor will promptly commence the Broader Outcome Works.

(b) The parties acknowledge and agree acknowledges that, subject to (e) and (f) below, consideration for carrying out any Broader Outcomes Works, will be as set out in the Broader Outcomes Plan and the Contract Price will be adjusted accordingly, provided such consideration will only become payable:

(i) where the Broader Outcomes Plan includes the basis and method of payment, in accordance with such basis and method of payment; or

(ii) where the Broader Outcomes Plan does not include the basis and method of payment, on the Contractor achieving any key performance indicator in the Broader Outcomes Plan and the Engineer's determination of reasonable compensation in respect of such key performance indicator (taking into account any amounts agreed in the Broader Outcomes Plan) and otherwise in accordance with clauses 12.1 and 12.2.

For the avoidance of any doubt, the Contractor is not entitled to any extension of the Contract Works Period or any Variation in respect of any Broader Outcomes Plan.

(c) The Contractor will obtain and maintain any additional insurances and/or make amendments to existing insurances under the Contract, as may be reasonably required by the Principal in connection with the performance of the Broader Outcomes Works. The Contractor will ensure that all such insurances and/or amendments are effected (prior to the commencement of the Broader Outcomes Works or, if later, the date from which the obligation to hold the relevant insurance arises) and maintained up to the issue of the Final Completion Certificate for the Contract Works.

(d) The Contractor acknowledges that at any time whatsoever it will not be entitled to claim, nor shall the Principal be require to pay, amounts exceeding the Innovation Fund Cap.

(e) The Principal may (in its sole discretion) at any time during the Contract Works Period:

(i) adjust the Innovation Fund Cap (whether by increasing or reducing the sum) on giving notice to the Contractor of the same;

(ii) instruct a reduction in the scope of Broader Outcomes Works that shall be effective immediately on giving notice to the Contractor;

provided that in the event the Principal notifies an instruction under 22.2(e)(ii), the Contractor shall be entitled to have the change treated as a Variation.

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(f) If at any time the available balance of the Innovation Fund Cap becomes zero (or de minimis), whether due to reduction under clause 22.2(e)(i), or due to use, then neither party will submit any further Broader Outcome Proposal until and unless the Principal gives notice that the Innovation Fund Cap has been raised.

22.3 BOI Test

(a) Either party may request a test of a Broader Outcomes Proposal (a "***BOI Test***"), by giving written notice to the other party. Where the Contractor requests a BOI Test, it is subject to the Principal's approval. The following provisions apply to any BOI Test:

(i) a BOI Test will commence no earlier than ten (10) Working Days following the next quarterly Governance Group meeting, or any later date feasible date (having reasonable regard to availability of the works, Plant, Materials, or processes involved);

(ii) unless otherwise agreed, the duration of the BOI Test will be not less than one (1) month and not more than three (3) months;

(iii) the parties will endeavour to agree the costs (if any) of the BOI Test and as soon as reasonably practicable record such agreement and the basis of payment. Where the parties are unable to reach agreement on such costs (if any) within ten (10) Working Days, the Engineer will determine the reasonable compensation payable to the Contractor in respect of the BOI Test;

(iv) any costs agreed or determined by the Engineer under clause 22.3(a)(iii) will be payable from the Innovation Fund Cap, provided any amounts payable shall not exceed the Innovation Fund Cap; and

(v) the BOI Test shall be carried out in accordance with the relevant Broader Outcome Proposal and any further requirements as agreed by the Governance Group.

(b) Upon conclusion of a BOI Test, the parties will meet to discuss whether the relevant Broader Outcomes Proposal should be developed into a more detailed plan. If the parties agree that the proposal should be developed, the process under clauses 22.1(d)-(f) shall apply.

(c) Notwithstanding anything to the contrary, the Principal may at any time instruct the Contractor to end a BOI Test, effective immediately on giving notice to the Contractor, if it considers (in its sole discretion) that:

(i) the cost of such BOI Test, or the implementation of such Broader Outcomes Proposal, will or is likely to exceed the Innovation Fund Cap; and/or

(ii) the BOI Test indicates that the Broader Outcomes Proposal is not beneficial, or likely not to be beneficial, to one or more Key Result Areas and/or the Principal's Broader Outcomes and Innovation goals generally.

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Schedule 3 – Form of Contractor's performance bond

DATE: [●]

THIS BOND IS GIVEN BY

[●] (the ***Financial Institution***)

BACKGROUND

A The Hutt City Council (the ***Principal***) and [***insert name of Contractor***] (the ***Contractor***) are party to a roading maintenance services contract dated [●] for the [●] (the ***Contract***).

B The Contract requires the Contractor to provide the Principal with a performance bond.

C At the request of the Contractor and in consideration of the Principal agreeing to enter into the Contract with the Contractor, the Financial Institution has agreed to provide this bond for the benefit of the Principal.

BY THIS BOND:

1 Words and expressions defined in the Contract and not otherwise defined in this bond have the same meanings when used in this bond.

2 The Financial Institution unconditionally (subject to clause 3) and irrevocably undertakes to the Principal to pay immediately any sum or sums which may from time to time be demanded by the Principal up to a maximum aggregate amount of NZ$[insert] (the ***Guaranteed Amount***) without any reference to the Contractor, and notwithstanding any notice or representation of the Contractor to the Financial Institution not to pay the same.

3 Any demand made by the Principal under clause 2 must:

3.1 be in writing;

3.2 be addressed to the Financial Institution either at the address set out on the execution page or at the registered office of the Financial Institution;

3.3 state the amount required to be paid;

3.4 state the bank account to which the amount demanded is to be paid; and

3.5 be accompanied by a certificate from the Engineer stating that, in the Engineer's opinion (acting independently and impartially), the Principal is entitled to call on this bond pursuant to the Contract and confirming the Engineer's agreement as to the amount demanded by the Principal.

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The amount demanded (up to the Guaranteed Amount) shall be paid to the bank account advised by the Principal to the Financial Institution in the demand.

4 The undertaking contained in clause 2 is unconditional (subject to clause 3) and irrevocable and the liability of the Financial Institution under this bond will not be affected in any way for any reason and, without limitation, the Financial Institution will not be released from any liability:

4.1 by any invalidity, illegality or unenforceability of the Contract;

4.2 by any alteration, amendment or variation in the terms of the Contract;

4.3 by any allowance of time by the Principal under the Contract;

4.4 by any forbearance or forgiveness or indulgence in respect of any matter or thing concerning the Contract on the part of the Principal;

4.5 by the insolvency, bankruptcy, winding up or reorganisation of the Contractor (including, without limitation, where the Contractor is placed into receivership, voluntary administration and/or liquidation);

4.6 by the termination of the Contract or of the Contractor's engagement under the Contract or by the Principal resuming exclusive occupancy of the Site;

4.7 by the novation of the Contract;

4.8 by any dispute or disagreement whatsoever between the Principal and the Contractor under or in relation to the Contract; nor

4.9 by any other act, omission, matter or thing (whether similar to the foregoing or otherwise) whereby the obligations of the Financial Institution under this bond might (but for this provision), under any applicable law or otherwise, be discharged or affected,

notwithstanding that any such occurrence is (where applicable) made, granted or given without the consent or knowledge of the Financial Institution.

5 The undertaking contained in clause 2 is a continuing undertaking and will remain in force until the earlier of the following:

5.1 receipt by the Financial Institution of written notification signed for and on behalf of the Principal that the undertaking is no longer required by the Principal which notification may be given at any time by the Principal in its discretion;

5.2 receipt by the Financial Institution of the written release from the Principal under clause 3.1.8 of the Contract; and

5.3 payment by the Financial Institution to the Principal of the Guaranteed Amount under this bond.

6 All payments under this bond shall be made in New Zealand dollars and shall be free of any set-off, withholding or deduction of any kind whatsoever.

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7 This bond is governed by and will be construed in accordance with the laws of New Zealand and the Financial Institution irrevocably submits to the non-exclusive jurisdiction of the courts of New Zealand and any courts which have jurisdiction to hear appeals from any of those courts and waives any right to object to proceedings being brought in those courts.

EXECUTION

Executed as a deed

[*Insert name of Financial Institution*] by its
Attorney:
in the presence of:

_____

Name:

Occupation:

Address:

_____
Signature of Attorney

_____
Name of Attorney

Address of the Financial Institution

Physical address:

Postal address:

Facsimile:

Telephone:

Attention:

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Schedules 7 – 12 – Insurances

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Schedule 7 – Information on Contractor arranged construction insurance

(Not Used)

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Schedule 8 – Information on Contractor arranged Plant insurance

To whom it may concern:

From *Click to enter text* *(Name of insurance company)*

Click to enter text *(Branch)*

Click to enter text *(Address)*

We confirm having effected Plant insurance for:

Click to enter text *(The Contractor)*

In respect of *Click to enter text* *(Project title)*

Policy wording title is *Click to enter text*

We advise that special terms, copy attached, have been applied to this policy *Select yes or no*

The following provisions apply:

☐ Annual policy

☐ Project specific policy

Policy expiry date *Click to enter a date*

8.4

The sums insured are (GST exclusive):

☐ All items of Plant Sum insured $ *Click to enter amount*

OR

☐ Valued schedule of construction Plant insured (copy attached)

The policy deductible (GST inclusive) is: $ *Click to enter amount*

Policy cover terms included are:

8.2.2 Discretionary cancellation clause *Select yes or no*

8.2.3(a) Reinstatement provision *Select yes or no*

8.2.4 Void *ab initio* for non-payment of premium without prior notification *Select yes or no*

No settlement delay due to exercise of subrogation *Select yes or no*

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We undertake that this policy will not be cancelled or amended by us within the period of insurance without written advice to the insured party which has arranged the insurances.

This insurance issued is subject to the terms and conditions of the policy. We do not warrant that this policy complies with the requirements of NZS 3917:2013.

Insurance Company Stamp *Click to enter text* **Date** *Click to enter a date*

(Or name of insurance broking company confirming cover)

SIGNED BY *Click to enter text or paste signature*

SIGNATORY TITLE *Click to enter text*

(Clause numbers refer to NZS 3917:2013 and are for information only.)

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Schedule 9 – Information on public liability insurance

To whom it may concern:

From *Click to enter text* *(Name of insurance company)*

Click to enter text *(Branch)*

Click to enter text *(Address)*

We confirm having effected public liability insurance to indemnify the Principal and the Contractor against legal liability to third parties for damage, loss or injury caused by an act or omission of the Contractor arising out of the performance of the Contract Works.

Click to enter text *(The Contractor)*

Click to enter text *(The Principal)*

In respect of *Click to enter text* *(Project title)*

Policy wording title is *Click to enter text*

We advise that special terms, copy attached, have been specifically applied to this project *Select yes or no*

The following provisions apply:

☐ Annual policy

☐ Project specific policy

Policy expiry date *Click to enter a date*

8.5, 8.9

The limit of indemnity (GST exclusive)	$	*Click to enter amount*
Sub-limit insured for (GST exclusive)		
Vibration, removal, or weakening of support	$	*Click to enter amount*
Forest and Rural Fires Act 1977	$	*Click to enter amount*
Underground services	$	*Click to enter amount*
Deductible (GST inclusive) is	$	*Click to enter amount*
Deductible for vibration, removal, or weakening of support (GST inclusive)	$	*Click to enter amount*
Deductible for underground services (GST inclusive)	$	*Click to enter amount*

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The policy also covers liability arising out of:

The ownership/use of Plant not required to be registered for road use	*Select yes or no*
The use of hired Plant	*Select yes or no*
The ownership/use of watercraft over 8 m	*Select yes or no*
The ownership/use of aircraft	*Select yes or no*
The use of explosives	*Select yes or no*

8.2, 8.7

Policy cover terms included are:

Reinstatement provisions	*Select yes or no*
Number of reinstatements	*Click to enter number*
Discretionary cancellation clause	*Select yes or no*
Void *ab intio* for non-payment of premium without prior notification	*Select yes or no*
Severally insured	*Select yes or no*
No settlement delay due to exercise of subrogation	*Select yes or no*

We undertake that this policy will not be cancelled or amended by us without written advice to the insured party which has arranged the insurances.

This insurance issued is subject to the terms and conditions of the policy. We do not warrant that this policy complies with the requirements of NZS 3917:2013.

Insurance Company Stamp *Click to enter text* **Date** *Click to enter a date*

(Or name of insurance broking company confirming cover)

SIGNED BY *Click to enter text or paste signature*

SIGNATORY TITLE *Click to enter text*

(Clause numbers refer to NZS 3917:2013 and are for information only.)

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Schedule 10 – Information on Contractor arranged motor vehicle insurance

To whom it may concern:

From *Click to enter text* *(Name of insurance company)*

Click to enter text *(Branch)*

Click to enter text *(Address)*

We confirm having effected motor fleet insurance for

Click to enter text *(The Contractor)*

In respect of *Click to enter text* *(Project title)*

Policy wording title is *Click to enter text*

We advise that special terms, copy attached, have been applied to this policy *Select yes or no*

The following provisions apply:

☐ Annual policy

☐ Project specific policy

Policy expiry date *Click to enter a date*

8.5.2

The limits of liability are (GST exclusive):

Section 2 – Liability $ *Click to enter amount*

For any one occurrence arising out of the same event

The policy deductibles are:

Section 2 – Liability (GST inclusive) $ *Click to enter amount*

Plus under age penalties

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8.2

Policy cover terms included are:

Section 2 Liability automatic reinstatement	*Select yes or no*
Discretionary cancellation clause	*Select yes or no*
Void *ab initio* for non-payment of premium without prior notification	*Select yes or no*
No settlement delay due to exercise of subrogation	*Select yes or no*

We undertake that this policy will not be cancelled or amended by us within the period of insurance without written advice to the insured party which has arranged the insurances.

This insurance issued is subject to the terms and conditions of the policy. We do not warrant that this policy complies with the requirements of NZS 3917:2013.

Insurance Company Stamp *Click to enter text* **Date** *Click to enter a date*

(Or name of insurance broking company confirming cover)

SIGNED BY *Click to enter text or paste signature*

SIGNATORY TITLE *Click to enter text*

(Clause numbers refer to NZS 3917:2013 and are for information only.)

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Schedule 12 – Information on Principal arranged construction and existing property insurance

(Not used)

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Schedule 15 – Certificate on Expiry

This Certificate on Expiry is issued under 10.3.1.

Contract for .....

.....*(Contract name and number if applicable)*

Principal .....*(Insert name of Principal)*

Contractor .....*(Insert name of Contractor)*

This certificate relates to:

☐ This whole of the Contract Works referred to above;

☐ The following Separable Portion .....*(specify)*

In accordance with 10.3.1, the Engineer certifies that the Contract Works or Separable Portion to which this certificate relates qualify for a Certificate on Expiry under 10.3, notwithstanding that there may be obligations of the Contractor under the Contract which remain unperformed or not properly performed (as listed in the attached list of outstanding obligations) in terms of 10.3.2.

☐ By this certificate the Engineer gives notice to the Contractor under 11.3.1 that the Engineer may instruct others to undertake those obligations listed in part A of the attached list of outstanding obligations; *(delete if not applicable)*

☐ The Contractor is required to carry out and complete those obligations listed in part B of the attached list of outstanding obligations by the date stated against the relevant obligations, failing which the Engineer may give notice under 11.3.1. *(delete if not applicable)*

The Contract Works Period expired

at the end of .....*(insert date)*

Signed by the Engineer .....

Name .....

Date .....

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LIST OF OUTSTANDING OBLIGATIONS

Obligations of the Contractor under the Contract which remain unperformed or not properly performed in terms of 10.3.2 and were identified during an inspection carried out by the Engineer or Engineer's Representative on

……*(insert date)*

Part A – Obligations which may be completed by others at the Contractor's Cost in accordance with 11.3.2 and 11.3.3

(list outstanding obligations)

……

……

……

Part B – Obligations the Contractor must complete by the date stated failing which the Engineer may give notice under 11.3.1.

(list outstanding obligations with date for completion against each)

……

……

……

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Schedule 16 – Final Completion Certificate

This certificate is a Final Completion Certificate issued under 11.4.1.

Contract for .....

.....*(Contract name and number if applicable)*

Principal .....*(Insert name of Principal)*

Contractor .....*(Insert name of Contractor)*

This certificate relates to:

☐ This whole of the Contract Works referred to above;

☐ The following Separable Portion .....*(specify)*

In accordance with 11.4.1, the Engineer certifies that the Contract Works or Separable Portion to which this certificate relates qualify for a Final Completion Certificate issued under 11.4

on .....*(insert date)* at .....*(insert time)*

Signed by the Engineer .....

Name .....

Date .....

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Schedule 17 – Form of Subcontractor Continuity Guarantee

DATE: [●]

PARTY

[*Name of Subcontractor*] (the ***Subcontractor***)

BACKGROUND

A Hutt City Council (the ***Principal***) has engaged the [***insert name of Contractor***] (the ***Contractor***) to carry out certain works pursuant to a roading maintenance services contract dated [●] (the ***Contract***).

B The Contractor has, with the consent of the Principal, subcontracted a portion (or portions) of the Contract Works under the Contract to the Subcontractor (the ***Subcontract Works***), as described in the contract between the Subcontractor and the Contractor dated [●] (the ***Subcontract***), a copy of which is contained in the Schedule to this deed.

C Pursuant to the provisions of the Contract, it is a condition that the Contractor and Subcontractor enter into this deed in favour of the Principal.

IT IS AGREED as follows:

7. DEFINITIONS AND INTERPRETATION

1.1 **Definitions**
In this deed, unless the context otherwise requires, words and expressions defined in the Contract and not otherwise defined in this deed have the same meanings when used in this deed.

1.2 **Interpretation**
In this deed, unless the context otherwise requires:

(a) covenants given in this deed by more than one person or entity bind each of them jointly and severally;

(b) paragraph headings are not to be used to construe this deed;

(c) words importing the singular number include the plural number and vice versa;

(d) words of any gender include the other gender and bodies corporate;

(e) a party includes its successors, permitted assigns and permitted novatees;

(f) except where expressly provided to the contrary all references in this deed to "including", "includes" or "include" are to be read as if that reference is followed by the words "without limitation";

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(g) references to a clause, clauses, Schedule or Schedules will, unless otherwise specified, be a reference to the corresponding clause, clauses, Schedule or Schedules in this deed; and

(h) the rule of construction known as contra proferentem will not apply to this deed.

8. CONTINUITY

The Subcontractor covenants that in the event of the Contract being terminated for any reason whatsoever or the Principal resuming exclusive occupancy of the Site under the Contract, the Subcontractor will, if required by the Principal, complete the Subcontract Works for the Principal under the same terms and conditions and for the same consideration as originally agreed between the Contractor and the Subcontractor, such terms and conditions being set out in the Subcontract annexed in the Schedule to this deed.

9. DISPUTE RESOLUTION

3.1 If any dispute or difference arises between the Subcontractor and the Contractor which is in any way connected with this deed or the Subcontract, the Subcontractor must promptly give notice in writing of that dispute or difference with details, to the Principal.

3.2 Any dispute or difference (a ***Dispute***) between the Principal and the Subcontractor arising out of this deed will be referred to arbitration in accordance with the provisions of the Arbitration Act 1996 or any statutory re-enactment or modification thereof.

3.3 The Dispute will be referred to a sole arbitrator. If the Principal and the Subcontractor fail to agree upon a sole arbitrator within 15 days after receipt of the notice of Dispute, the arbitrator will be appointed by the then President of the Arbitrators' and Mediators' Institute of New Zealand (or by his or her nominee).

3.4 Notwithstanding clauses 3.2 and 3.3, if any dispute or difference arises under this deed which is related to a dispute or difference under the Contract, the parties agree that, subject to any discretion to the contrary of a court, arbitrator or mediator, as the case may be, or unless otherwise required by the Principal, the dispute or difference is to be dealt with at the same time and in conjunction with the dispute or difference under the Contract.

10. ASSIGNMENT AND NOVATION

4.1 The Subcontractor may not assign, charge or novate, whether in part or in whole, any of its rights, benefits or obligations under this deed without the prior written consent of the Principal (which it may or may not give at its discretion).

4.2 The Subcontractor acknowledges and agrees that the Principal may assign, charge or novate all or any part of its rights and/or obligations under this deed to any assignee, chargee or novatee of the Principal under the Contract or to any other Person without the Subcontractor's consent.

4.3 The Subcontractor must, if and when requested by the Principal, promptly do all things and execute all such documents reasonably necessary to give effect to any assignment, charge or novation by the Principal, including in the case of a novation, entering into a deed of novation with the Principal and the relevant Person nominated by the Principal in a form required by the Principal.

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11. MISCELLANEOUS

5.1 **Contract and Commercial Law Act 2017**

The Subcontractor acknowledges and agrees that, pursuant to section 12 of the Contract and Commercial Law Act 2017, the rights and benefits under this deed will accrue to and be enforceable by not only the Principal but also any other assignee or novatee of the Principal's interest under this deed.

5.2 **Governing law**

This deed is governed by and will be construed in accordance with the laws of New Zealand, and without limitation or prejudice to clause 3 the Subcontractor irrevocably submits to the non-exclusive jurisdiction of the courts of New Zealand and any courts which have jurisdiction to hear appeals from any of those courts and waives any right to object to any proceedings being brought in those courts.

EXECUTION

Executed as a deed

EXECUTED by [●] as Subcontractor
by

Director	Director
Print name	Print name

Witness to both signatures

Print name

Occupation

Address

Address of the Subcontractor

Physical address:

Postal address:

Facsimile:

Email:

Telephone:

Attention:

NOTE: This document is to be executed as a deed. Accordingly:

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- companies should sign by two directors, unless there is only one director of the company in which case that director should sign and his/her signature should be witnessed by another person (as well as signing, the witness should record his/her name, occupation and address); and

- where a party to this deed is an individual, that person should sign and his/her signature should be witnessed by another person (as well as signing, the witness should record his/her name, occupation and address).

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Schedule 18 – (Not used)

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Schedule 19 – Partnering Values

1. Background

1.1 The parties believe that maximum value and benefits will be delivered to contract partners when a partnering philosophy is adopted.

1.2 This means that all parties need to understand the culture, values, and key business drivers of the others, and commit to work together to create a relationship that supports these imperatives, and is open, committed, proactive, and professional.

1.3 The Principal's culture is about service. For the most part, that service is delivered through contracts and contractual arrangements with our suppliers and contractors. For many of the Principal's customers, the Contractor is the face of the Principal. The Principal sees maintaining and building partnerships with contractors as key to improving customer service.

2. Key relationship principles

2.1 The parties will establish a sustainable and enduring working relationship that upholds the following key relationship principles:

(a) regular and effective communications;

(b) early identification of any matters which will impact on service delivery, delivery dates and Project costs;

(c) regular reviews of risks and opportunities;

(d) the sharing of relevant environmental and technical information;

(e) working together and contributing to positive outcomes; and

(f) acting in good faith, mutual respect, openness, transparency and fairness.

3. Partnering Values

3.1 The Contractor will:

(a) recognise the importance to the Principal and its customers of the landfill business (and the Contract Works), and strive to provide excellent customer service;

(b) be reliable, consistent and proactive in providing the Contract Works;

(c) apply a positive and pragmatic approach to providing solutions to issues;

(d) strive for outcomes which represent success for the Principal, its customers, and the Contractor;

(e) be responsible and act in good faith with honesty and integrity at all times; and

(f) respect the Principal's culture and values, and ensure that the services (and the Contract Works) are provided in a manner that is consistent with, and supportive of the same.

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3.2 The Principal will:

(a) recognise and affirm the Contractor's key business drivers, values and culture;

(b) to the extent reasonably possible without compromising the parties obligations and accountabilities under the Contract, work with the Contractor to identify and implement strategies to facilitate the achievement by the Contractor of its commercial objectives;

(c) strive for outcomes which represent success for the Principal, its customers, and the Contractor; and

(d) be responsible and act in good faith with honesty and integrity at all times.

4. Rights not affected

4.1 For the avoidance of any doubt, this Schedule 19 will not impinge on or otherwise fetter in any way whatsoever the exercise by a party of any of the rights and remedies it may have under or in relation to or in connection with the Contract.

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Schedule 20 – Method of Measurement and Basis of Payment

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REPORT

Tonkin+Taylor

Silverstream Landfill Operations Contract: Methods of Measurement and Basis of Payment

Contract AD22- 2102

Prepared for
Hutt City Council | Te Awa Kairangi
Prepared by
Tonkin & Taylor Ltd
Date
January 2023
Job Number
82948.1000

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www.tonkintaylor.co.nz

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Distribution:

Hutt City Council | Te Awa Kairangi	1 copy
Tonkin & Taylor Ltd (FILE)	1 copy

1 Methods of Measurements and Basis of Payment

1.1 General

The whole of this Clause shall be read in conjunction with the General Conditions (as amended by Schedule 2: Special Conditions of Contract – Other Conditions of Contract, Schedule 1: Special Conditions of Contract – Specific Conditions of Contract, the Schedule of Prices, these Specifications and Appendices.

1.1.1 Scheduled Quantities

For a Measure and Value Contract, the Contract Price is determined with reference to the measured quantities of work actually carried out by the Contractor in accordance with the provisions of the Contract documents.

The quantities set out in the Schedule of Prices are estimates only of how much of each kind of work is included in the Contract Works. Such quantities will not be considered as final measurements. All work will be measured by the Engineer, in the field or from the Drawings, upon completion of the relevant work. Payment will be at the rates entered in the Schedule of Prices or at prices otherwise determined in accordance with the terms of the Contract documents.

The Contractor shall not use the Schedule of Prices for ordering.

1.1.2 Basic Methods of Measurement

Except where qualified otherwise in this Clause and/or the Specifications, measurements will generally be determined in accordance with NZS 4224:1983, "Code of Practice for Measurement of Civil Engineering Quantities".

Earthworks volumes will be calculated using the method of end areas. Prismoidal corrections will be used where judged appropriate by the Engineer. The positioning of sections will be appropriate to the shape and scale of the volume being measured to satisfy the Engineer that volumes are reliably measured.

1.1.3 Abbreviations

The following abbreviations are used to describe "units" in the Schedule of Prices:

m	-	linear metre
sq.m	-	square metre
cu.m	-	cubic metre
ea	-	each
Prov. Item	-	Provisional Item
PS	-	Provisional Sum
LS	-	Lump Sum
No.	-	number
hr	-	hour
kg	-	kilogram
Wk	-	week
%	-	percentage
t	-	tonne
Mth	-	month
Bi-Mthly	-	every two months

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1.1.4 Adequacy of Rates and Sums

Each item in the Schedule of Prices shall have a rate entered against it. Rates shall be in NZ Dollars to two decimal places. Where no rate is entered, it shall be deemed to be $0.00.

The items in the Schedule of Prices together with the rates and sums entered against them cover everything necessary for the completion and maintenance of the Contract Works to the complete satisfaction of the Engineer.

Items have been provided in the Schedule of Prices for all major operations and the rates and sums entered against them cover all accessories and minor items together with the cost of complying with all general obligations imposed by the Contract.

Except where identified separately in the Schedule of Prices, all miscellaneous items, supervision, contingencies, maintenance, conveyance of plant and incidental work, plus general overhead administration are incorporated in the rates and sums entered in the Schedule of Prices.

All rates and sums entered in the Schedule of Prices are proportioned, having regard to the special conditions of the work in each case. It will be deemed that all indirect costs, risk and profit are distributed among the rates and prices entered in the Schedule of Prices in proportion to the direct costs allowed for by the Contractor in each rate and price.

The positions shown on the Drawings may be varied. Each price, rate or sum entered in the Schedule of Prices covers the scope of work defined regardless of where the work is performed on the Site.

1.1.5 Costs for Decarbonisation

The Contractor shall assume a baseline carbon emission of 651 tonnes, per annum, from the Date of Commencement. This is based on scope 1 and scope 2 emissions[1] for the landfill operation for the 2020/2021 financial year.

All rates submitted in the Schedule of Prices shall be inclusive of all costs to achieve the following decarbonisation targets for the landfill operation as set by Council:

- 10% (minimum) reduction in carbon emissions by 2027 (65.1t reduction from baseline)
- 25% (minimum) reduction in carbon emissions by 2030 (163t reduction from baseline), noting that 50% (326t reduction from baseline), is desirable

[1] 'Measuring Emissions: A Guide for Organisations', Ministry for the Environment, 2020

1.1.6 Provisional Sums, Provisional Items

All sums and items set out in the Schedule of Prices which are stated to be provisional shall be expended only at the direction and discretion of the Engineer and if used either wholly or in part shall as to the amount not used be deducted from the Contract Price.

Provisional Items shall be treated as Provisional Sums for payment purposes.

Each Provisional Item or Sum is priced so that the application of the tendered rate to the actual quantity of work completed under the item (including nil work) provides full compensation to the Contractor.

The amount payable to the Contractor in respect to work covered by a Provisional Sum shall be varied by the substitution for the Provisional Sum of the following:

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i where work to which the Provisional Sum relates has been carried out by the Contractor, the value of the work so executed valued as follows:

- at the several prices or rates set opposite each such item in the Schedule of Prices or
- any additions, deviations, or alterations which include any description of work not named in the Schedule valued at rates fixed by the Engineer.

ii where work to which the Provisional Sum relates has been carried out by a Nominated Subcontractor, the amount payable to that sub-contractor under the terms of a subcontract approved by the Engineer together with the markup for the Contractor's expenses and profit specified in the Schedule of Prices.

The Contractor shall when required by the Engineer produce all quotations, invoices, vouchers, time sheets and accounts or receipts in connection with expenditure in respect of Provisional Sums.

1.1.7 Standard Specifications

The rates allow for the latest edition of standard specifications at the date of closing of tenders. However, the Contract Works shall be constructed to the latest edition or amendment at the time of construction and any revision shall be treated as a Variation with the timing of implementation to the Engineer's instruction.

1.1.8 Acts and Regulations

All costs incurred by the Contractor in complying with Clause 5.11.1 of NZS 3917, "Compliance with Laws" applicable to the Contract Works are deemed to be incorporated in the tendered rates.

1.1.9 Stockpile and Borrow Areas

All costs, including establishment, operation, maintenance and disestablishment associated with stockpile and borrow areas are deemed to be incorporated in the tendered rates.

The positions of stockpiles and borrows shown on the Drawings may be varied over the contract period. Each price, rate or sum entered in the Schedule of Prices covers the scope of work defined regardless of where the work is performed on the Site.

1.1.10 Earthworks

1.1.10.1 General

Excavation and filling will be paid for as in-situ net cubic metre volume as measured from the contours, levels and defined boundaries shown on the Drawings. It is the Contractor's responsibility to verify the existing excavated or finished levels before the next stage of construction commences. Should the Contractor disagree with the levels shown on the Drawings, then the Contractor shall submit to the Engineer for approval and agreement the Drawings the Contractor proposes should be the basis for measurement and payment. Any such submission shall be made at least 10 Working Days prior to the scheduled commencement of work in the affected areas. The Engineer will review and either agree with the Contractor's submission or discuss points of disagreement and agree upon a factual basis for measurement and payment.

The Contractor shall not commence excavation or filling in any area for which the basis of measurement has not yet been agreed.

The Schedule of Prices for earthworks is based on the cut/fill/topsoil volumes derived from the Drawings and other information made available to the Contractor. These volumes are estimates of the volumes required to complete the Contract Works. Payment will be made on the actual volumes

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required to complete the works as per the Engineer's direction. The rates include for all over-excavation, shoring and filling required to ensure the satisfactory completion of the works. Fill to replace temporary (working) excavations or unauthorised excavations beyond prescribed lines which are the responsibility of the Contractor will not be measured.

When the Contractor is directed by the Engineer to dispose of Unsuitable Materials in the active disposal area of the Landfill the Contractor will not be charged a gate fee for such disposal.

1.1.10.2 Filling

Filling, including drainage gravel to the leachate drainage layer and final capping, will be measured as the in-situ net cubic metre volume (or plan square meters where fill is placed in layers of uniform thickness) of fill measured between levels established prior to filling and after filling or between levels established prior to filling and the lines prescribed on the Drawings or entirely between the lines prescribed on the Drawings as appropriate and in accordance with the Earthworks and related works 'General' subsection. Where fill dimensions are labelled as minimum values, the minimum values will be used to calculate fill volumes regardless of whether or not the dimensions have been exceeded. For the leachate drainage layer and Landfill capping fills the dimensions (thickness) shown of the Drawings will be used to calculate fill volumes regardless of whether or not these dimensions have been exceeded.

The rates for filling apply to bulk earthworks, drainage gravel and the like as specified in Clause 8 and 9 of these Specifications respectively. Waste filling will be measured as Landfill volume used as described in Clause 4 of these Specifications.

The rates for filling allow for all wetting or drying, levelling, compaction by machine or hand methods, testing or survey interruptions, testing (unless scheduled separately), providing samples, drainage protection and remedial works after testing.

The rates for filling allow for supply of materials to site or for excavation, sorting and processing of fill materials from stockpiles or borrow sites within the Landfill site as appropriate to provide sufficient quality of fill complying with the requirements of these Specifications.

The rates allow for all carting, temporary stockpiling and placing in a fill area, and for all necessary trimming and all work necessary to prepare the surfaces to be filled, as shown on the Drawings and described in these Specifications.

1.1.10.3 Filter cloth, Geotextiles and Geogrids

Filter cloth, geotextile and Geogrid will be measured in square metres of plan area within the limits shown on the Drawings or directed by the Engineer. The rate includes for material supply, protection, placement, fastening, jointing, lapping, QA/QC, and any other work necessary to place.

1.2 Descriptions of Schedule Items

The descriptions entered against the items in the Schedule of Prices are given only to identify the items. Reference must be made elsewhere in the Contract documents for a full description of the work and general liabilities covered by the rates and prices entered against each item.

The following Item numbers refer to those used in the Schedule of Prices.

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SECTION 1.0 PRELIMINARY AND GENERAL

Item 1.1 Establishment and Disestablishment

The establishment Lump Sum includes for the Contractor's mobilisation, establishment on Site of all labour, equipment, plant, vehicles, accommodation, temporary services, preparation and submission of a 'Transition Plan' (refer Cl 5.1A.3 of the Other Conditions of Contract), all overhead costs such as arise from mobilising resources and plant, permit costs and the demobilisation including clean up and removal on completion.

The proportion of the sum will be certified by the Engineer as follows to be certified from time to time, will be assessed by the Engineer in accordance with the stage of Contract completion.

- 50% after site establishment.
- 25% after disestablishment.
- 25% following removal of all relevant facilities from the Site and a Certificate of Practical Completion has been issued for the contract.

Item 1.2 Contract administration

The Lump Sum monthly rate entered in the Schedule of Prices covers all administrative, ongoing time related overhead costs such as site superintendence, survey requirements, communications, bond and insurance charges, ongoing permitting costs, financing costs, handheld equipment, vehicles, head office backup, provision and updating of the programme of works, updating management plans, observation of health and safety procedures and the like during the contract period up to the Date of Expiry. The rate will not be paid for any extensions of time granted on grounds other than the net effect of a Variation.

The rate shall be deemed to fully compensate the Contractor for time related Costs in relation to an extension of time by reason of the net effect of a Variation.

Item 1.3 Performance bonus payment (Provisional Item)

The quality of the Landfill operations is important to the Principal and a performance bonus for carrying out the Contract Works in compliance with the Performance Criteria outlined in section 6 of the Specification is included in the payment arrangements to reflect this.

The Performance Bonus Payment is a Provisional Sum and shall be paid to the Contractor each month as set out in the Schedule of Prices and Section 6 of the Specification provided no more than two demerit points have been issued for the claim month and no more than six demerit points have been issued in total in the six-month period ending with the claim month.

The issue of demerit points is linked to the non-achievement of performance indicators as out in Clause 6 in these Specifications.

Item 1.4 Broader outcomes and innovation fund (Provisional Item)

The intent of the broader outcomes and innovation fund is to encourage all contractual parties to think wider than the immediate contract and to consider innovations and improvement measures that will add value to the landfill operation and Council's broader outcomes. The framework for this initiative is outlined in section 7 of the Specification and Section 22 (Broader Outcomes and Innovation) of the Contract).

Each KPI, developed by the Contractor, shall be valued as outlined in 7.3 of the Specification, unless otherwise agreed under a Broader Outcomes Plan. The monetary value of all KPIs developed each year shall not exceed the Innovation Fund Cap in each calendar year.

Item 1.5 Landfill Operator Management Plans and Reporting

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The Lump Sum rates entered in the Schedule of Prices against these items allow for the complete preparation and acceptance including, but not limited to, drafting of the Plan (Site Specific Safety Plan, Traffic Management Plan, Quality Plan, Environmental Management Plan, Asbestos Management Plan, Carbon Measurement Framework and Report, Monthly Report and Annual report), submitting the draft Plan to the Engineer for review, reviewing the draft Plan, incorporating the Engineer's comments, if any, and preparing and submitting the final Plan as specified.

Where the Contractor submits a plan more than twice to the Engineer for review and acceptance all costs incurred by the Engineer in reviewing the third and/or subsequent submissions of the Plan may be deducted from payments to the Contractor.

Item 1.6 Inspections and Reporting

These Lump Sum items shall be paid to the Contractor on a monthly basis and shall allow for all inspections and water quality readings as required by the Specification and Landfill Operator Management Plans.

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SECTION 2.0 LANDFILL OPERATION

Item 2.1 Kiosk Operation and Financial Management

The Lump Sum, payable monthly, shall include all activities involved with the collection of fees at the kiosk and the delivery of the fees in total to the Hutt City Council. Allowance shall be made for kiosk staffing and operation, fee collection, invoicing, data entry, maintenance of kiosk computer software and training, accounting, recording, reporting, receipting of all transactions at the kiosk, and the delivery of all monies or takings to a bank trust account as specified. Allowance shall be made for all bank charges for the establishment and operation of the trust account including overdraft facilities. Interest accrued in the trust account shall be payable to the Contractor.

Allowance shall be made for all computer costs, stationery, invoicing, management of accounts, handling of payments, eftpos facilities and charges, management of credit and debtors. The collection of bad debts shall be the responsibility of the Contractor. The Contractor shall not be financial liable for bad debts, this shall be the responsibility of the Council.

Allowance shall be made for all reconciliations, audited accounts and financial reports required by the Specification to be forwarded to the Hutt City Council.

Item 2.2 Waste acceptance

Item 2.2.1 Receipt and placement of up to 7,500 t of general commercial waste per month

A payment shall be made to the Contractor on a monthly basis for receipt and placement at the Landfill of up to 7,500 tonnes of waste in that month.

The rate for disposal of this waste to the Landfill includes all costs associated with the receipt and placement of the waste at the tipping face including inspection of the waste, control of nuisances, spreading and compacting the waste and all other requirements of the Specification, Landfill Management Plan and the Contractors Operational Management Plans.

This rate shall include placement of the fluff layer against the landfill liner.

Payment for the work covered by this item shall be made as a monthly Lump Sum.

Item 2.2.2 Receipt and placement in excess of 7,500t of general commercial waste per month

The quantity claimed against this item each month shall be the total tonnage of general waste for the month less 7,500t claimed against item 2.2.1.

The rate for disposal of this waste to the Landfill includes all costs associated with the receipt and placement of the waste at the tipping face including inspection of the waste, control of nuisances, spreading and compacting the waste and all other requirements of the Specification, Landfill Management Plan and the Contractors Operational Management Plans.

The rate shall include placement of the fluff layer against the landfill liner.

Payment for this item will be per tonne, based on monthly weighbridge tonnages to be submitted with the Contractors monthly claim.

Item 2.3 Waste acceptance – special waste

Items 2.3.1 to 2.3.4 Receipt and placement of waste types

A payment shall be made to the Contractor on a monthly basis for the tonnage of special waste (of different types) received at the Landfill and placed and compacted into the Landfill in that month.

The quantity of waste disposed to the Landfill will be paid for as the tonnage of each particular waste type measured over the weighbridge after any adjustments required for waste types

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incorrectly entered into the weighbridge system by customers bringing waste to the Site. The rates for disposal of waste to the Landfill include all costs associated with the receipt and placement of waste at the tipping face including inspection of the waste, control of nuisances, spreading and compacting the waste and placement of daily and intermediate cover and all other requirements of the Landfill Management Plan and the Contractors Operational Management Plans.

The type of wastes is listed under Schedule of Prices Items 2.3.1 to 2.3.4.

Item 2.4 Phase 3 Initial Costs (Prov. Items)

Item 2.4.1 Transfer of waste from the phase 3 transfer pad to phase 3 tipping pad

This item shall allow for all costs associated with operation and maintenance of the phase 3 transfer pad, loading refuse from the phase 3 transfer pad, cartage of refuse via the phase 3 access road and unloading of refuse at the phase 3 tip pad. The number and type of plant shall be determined by the Contractor but the transfer vehicle(s) must be suitable for traversing steep grades on an unsealed road in all weather conditions (for example articulated dump truck or similar approved). This rate shall include for all maintenance of such vehicles.

This rate shall strictly only apply until such time as the phase 3 access can be safely traversed by commercial customers and the transfer pad and transfer trucks are no longer required.

Note this rate does not allow for the construction of the phase 3 transfer pad and the phase 3 access road, which will either be a variation to the contract or constructed by others (at Councils sole discretion).

Refer also to section 4.4.2 of this Specification.

Payment of this Provisional Item shall be made as a monthly Lump Sum and only for the months to which this item is applicable.

Item 2.4.2 Second tip pad operation

It is envisaged that during the initial filling of the phase 3 cell, the Contractor will need to maintain and operate an active tipping pad in phase 2 and an additional tipping pad in phase 3. This rate shall include all costs for the phase 3 tipping pad while the phase 2 tipping pad is still active. The rate shall include provision for handling, pushing out and compaction of refuse as specified.

This rate shall strictly only apply until such time as the phase 2 tip pad closes and the phase 3 tipping pad becomes the sole active landfill tip face. Refer also to section 4.4.2 of this Specification.

Payment of this Provisional Item shall be made as a monthly Lump Sum and only for the months to which this item is applicable.

Item 2.5 Daily Cover

Item 2.5.1 Application of daily cover

Daily cover shall be paid as a Day rate.

The rates shall allow for all excavation from all on site borrows, loading, carting, stockpiling, uplifting from stockpiles and spreading over refuse as per Specification and LMP. The rates shall allow for removal of daily cover as far as reasonably practicable at the start of each working day. The Contractor shall not be paid the daily rate in the event of a failure to apply daily cover.

The rate shall also allow for a provision of a stockpile of daily cover material, suitable for use during inclement weather (for example less weathered rock from borrow).

Item 2.6 Landfill Capping (Prov. Items)

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Item 2.6.1 Supply and install Intermediate capping

If instructed, this item shall cover the cost of construction of the intermediate capping as specified and as shown in Detail K on drawing 829848.1000-042. The rate shall allow for the cost of all Plant, Materials, and Labour required for excavation of Type 1 rock fill from stockpiles or on site borrow areas and placement as intermediate cover as specified. This shall include control of layer thickness, compaction and testing of material and erosion and sediment controls as required but including as a minimum a silt fence at the downhill edge of the works area.

This item shall be measured in square metres plan area capped within the limits of instructed construction works.

Note: Excludes grassing/hydroseed itemised separately.

Item 2.6.2 Supply and install Final capping

If instructed, this item covers the cost of the construction of landfill final capping as specified and as shown in Detail G on drawing 829848.1000-042. The rate shall allow for the cost of all Plant, Materials, and Labour required for excavation of Type 1B low permeability fill from stockpiles or on site borrow areas and placement as final capping. This shall include clearing any vegetation, stripping any remaining organic matter and preparation of the intermediate cover to receive the capping, carting, control of layer thickness, compaction and testing of material and erosion and sediment controls as required but including as a minimum a silt fence at the downhill edge of the works area.

This item shall be measured in square metres plan area capped within the limits of instructed construction works.

Note: This rate shall not include topsoil and grassing, which is scheduled separately.

Item 2.6.3 Topsoil of final capping (100 mm)

If instructed, topsoiling (as shown in Detail G on drawing 829848.1000-042 or elsewhere on the site) will be measured in square metres plan area to be topsoiled within the limits of construction works shown on the Drawings. The rates for topsoiling allow for the supply and installation of imported topsoil, as specified, including cost of all Plant, Materials, and Labour required including rescarifying/cultivation/harrowing, picking up and spreading of topsoil, levelling/smoothing and preparing for seeding.

Item 2.6.4 Supply and application of grass seed or hydroseed

If instructed, grassing of the final or intermediate capping will be measured in square metres plan area to be grassed within the limits of construction works shown on the Drawings. The rates also allow for the cost of grassing (seed or hydroseed, as specified), the supply and spreading of all fertilisers, the supply, certification and drilling of grass seed, and the maintenance and reinstatement of bare patches until all surfaces are completely covered with a good strike of revegetation.

60% of the price for grassing will be paid upon completion of grassing, with a further 40% payable after a strike of at least 95% of the area to be grassed. The rates allow for regrassing any areas where a satisfactory strike and establishment is not achieved from the initial sowing.

Item 2.6.5 Supply and place up to 100 mm thick mulch layer from stockpile

If instructed, this rate shall allow for all costs of transfer from stockpile and spreading on the landfill face for use as an environmental control measure. The rate shall include all costs associated with loading, cartage, unloading a spreading of mulch on intermediate or final capping as specified and/or directed by the Engineer.

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In the event of the closure of the transfer station, this rate will be void and will either be renegotiated or no longer used. This will be confirmed by the Engineer.

Item 2.7 Liner Protection and Leachate Drainage

Item 2.7.1 Supply and place protection geotextile (Prov. Item)

If instructed, protection geotextile will be measured in square metres installed in the plane of the slope as shown on Detail J on drawing 82948.1000-042. The rates shall allow for the cost of all Plant, Materials and Labour required for installation of the geotextile including for material supply, protection, placement, fastening, lapping QA/QC, and any other work necessary to place the material in accordance with the requirements of these Specifications. The Contractor should make allowance in the rates for overlaps, scrap, and wastage.

Item 2.7.2 Supply and place protection geogrid (Prov. Item)

If instructed, geogrids will be measured in square metres installed in the plane of the slope as shown on Detail J on drawing 82948.1000-042. The rates shall allow for the cost of all Plant, Materials and Labour required for installation of the geogrid including for material supply, protection, placement, fastening, lapping QA/QC, and any other work necessary to place the material in accordance with the requirements of these Specifications. The Contractor should make allowance in the rates for overlaps, scrap, and wastage.

Item 2.7.3 Supply and place leachate gravels

If instructed, drainage gravel to the leachate collection layer will be measured as the solid volume in cubic metres measured between levels established prior to filling and the lines prescribed on the Drawings or entirely between the lines prescribed on the Drawings as appropriate. Where fill dimensions are minimum values, the minimum values will be used to calculate fill volumes regardless of whether, or not the dimensions have been exceeded.

Rates shall allow for the cost of all Plant, Materials, and Labour required for supply of leachate drainage gravel, hauling, placing, levelling, test interruptions, providing samples, drainage protection and remedial works after testing.

Item 2.7.4 Supply and place filter geotextile

If instructed, filter geotextile will be measured in square metres installed in the plane of the slope. The rates shall allow for the cost of all Plant, Materials and Labour required for installation of the geotextile including for material supply, protection, placement, fastening, lapping QA/QC and any other work necessary to place the material in accordance with the requirements of these Specifications. The Contractor should make allowance in the rates for overlaps, scrap, and wastage.

Item 2.7.5 Supply and install a leachate collection drain (Prov. Item)

If instructed, the installation of a leachate collection drain shall be measured per liner metre and shall be constructed as specified and as per Detail D on drawing 82948.1000-041. The rates shall allow for the cost of all Plant, Materials and Labour required for installation of the collection drain including for material supply, placement of drainage aggregate, pipe and geotextile surround, type 1 fill and any other work necessary to place the material in accordance with the requirements of these Specifications. The Contractor should make allowance in the rates for overlaps, scrap, and wastage.

Item 2.7.6 Supply and install a leachate conveyance drain (Prov. Item)

If instructed, the installation of a leachate conveyance drain shall be measured per liner metre and shall be constructed as specified and as per Detail E on drawing 82948.1000-041. The rates shall allow for the cost of all Plant, Materials and Labour required for installation of the conveyance drain including for material supply, placement of pipe, type 1 fill and any other work necessary to place

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the material in accordance with the requirements of these Specifications. The Contractor should make allowance in the rates for scrap, and wastage.

Item 2.7.7 Undertake typical leachate breakout repair (Prov. Item)

If instructed, the leachate repair shall be measured as a Lump Sum item and shall be undertaken as specified and shown on Detail H on drawing 82948.1000-042 up to a trench length of 3 m. The rates shall allow for the cost of all Plant, Materials and Labour required for excavation of waste, carting of waste to landfill, reinstatement as shown on Detail H and any other work necessary to place the material in accordance with the requirements of these Specifications. The Contractor should make allowance in the rates for scrap, and wastage.

Item 2.8 Drainage (Prov. Items)

Item 2.8.1 Supply material and install a typical temporary stormwater v-drain

If instructed, the temporary stormwater v-drain shall be measured per liner metre and shall be undertaken as specified and shown on Detail A on drawing 82948.1000-040. The rates shall allow for the cost of all Plant, Materials and Labour required for installation of the temporary stormwater v-drain including for material supply, all earthworks, installation and pinning of geotextile any other work necessary to place the material in accordance with the requirements of these Specifications. The Contractor should make allowance in the rates for overlaps, scrap, and wastage.

Item 2.8.2 Supply material and install a standard sprayed concrete stormwater drain

If instructed, the standard sprayed concrete stormwater drain (at toe of cutting or on level ground) shall me measured per liner metre and shall be undertaken as specified and shown on Details B and C on drawing 82948.1000-040. The rates shall allow for the cost of all Plant, Materials and Labour required for installation of the sprayed concrete stormwater drain including for material supply, all earthworks, shotcrete any other work necessary to place the material in accordance with the requirements of these Specifications. The Contractor should make allowance in the rates for wastage.

Item 2.9 Miscellaneous (Prov. Items)

Item 2.9.1 Supply and install temporary leachate gravel gas inhibitor

If instructed, the temporary leachate gravel gas inhibitor shall me measured per liner metre and shall be undertaken as specified and shown on Detail L on drawing 82948.1000-042. The rates shall allow for the cost of all Plant, Materials and Labour required for installation of the inhibitor detail including cleaning of surfaces to receive polyethylene membrane, removal off any rocks that could damage the membrane, placement of the membrane, placement of 200 mm type 1B or 1C material over the membrane and any other work necessary to construct the inhibitor detail in accordance with the requirements of these Specifications. The Contractor should make allowance in the rates for overlaps, scrap and wastage.

Item 2.9.2 Supply and install temporary 1 m high orange mesh safety fence

If instructed, the temporary 1 m high orange mesh safety fence shall me measured per liner metre. The rates shall allow for the cost of all Plant, Materials and Labour required for installation of the fence including cost of fencing, warratahs (including end caps), number 8 wire any other work necessary to construct the inhibitor detail in accordance with the requirements of these Specifications. The Contractor should make allowance in the rates for overlaps, scrap and wastage.

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SECTION 3.0 REFUSE TRANSFER STATION (SEPARABLE PORTION 1)

Note: Refer to Specification Clause 4.3. The operation of the transfer station is guaranteed for two years from the Date of Commencement (refer also to Cl 10.2A of the Special Conditions of Contract). Thereafter the transfer station operation will be reviewed monthly at Councils sole and absolute discretion.

Item 3.1 Empty the refuse pit using suitable plant and transfer waste to landfill

This item shall be paid as a monthly Lump Sum. The rate shall include allow for the cost of all Plant, Materials and Labour required to clear the refuse transfer pit and cart all refuse to landfill. The rate shall allow for the use of suitable plant to push refuse to the transfer loading area (front end loader or similar approved), use of suitable plant to load the transfer truck at grade (grapple loader or similar approved), a transfer truck to cart refuse to landfill and unloading at the active landfill tip face. Note the plant for loading out the transfer station should have rubber tracks or similar approved to avoid damage to structural asphalt surfacing. The rate shall include for accurate weighing and record keeping off each transfer truck load either at the weighbridge or via use of a calibrated load cell on the transfer truck. The rate shall also have an allowance for fluctuations in the frequency of truck movements and refuse pit emptying required to ensure that adequate capacity is maintained in the refuse pit and that sufficient unloading bays are open for public use.

Item 3.2 Maintenance of transfer station

This item shall be paid as a monthly Lump Sum. The rate shall allow for the cost of all Plant, Materials and Labour required to maintain the transfer station to a high level off service. The rate shall include for maintenance of the transfer station surfaces (clean and free from silt and litter), roading, kerbing, line marking, delineation, signage, stormwater controls, fencing, silt controls, buildings and barriers.

Item 3.3 Provision of 1 full time equivalent (Transfer Station Concierge)

This item shall be paid as a monthly Lump Sum and shall allow for all costs associated with the provision of a transfer station Concierge to carry out the duties listed in section 4.3.4 of the Specification. The Transfer Station Concierge hours of work shall be a total of 40 hours with 10 hr days on Saturday and Sunday with remaining hours split over 3 days Monday to Friday.

Item 3.4 Greenwaste

Item 3.4.1 Monthly mulching, weighing and removal of greenwaste from site for composting and greenwaste area maintenance

This item shall be paid as a monthly Lump Sum and shall allow for all costs of Plant, Materials, Labour and Subcontractor costs required to mulch the greenwaste stockpile, load and cart off site for purpose of composting or other use approved by the Engineer. The rate shall include for weighing and record keeping of all materials removed from site, maintenance of the greenwaste stockpile and metalled public greenwaste tip pad, which will require regrading and resurfacing with AP65 from time to time (or similar approved by the Engineer). The rate shall allow for 2 such regrading surface treatments per annum.

All greenwaste that has been mulched, must be weighed on the weighbridge prior to leaving landfill. These weights must be recorded by the Contractor and submitted in monthly reports.

The estimated annual quantum of greenwaste is 3000 tonnes per annum.

Item 3.4.2 Mulching off greenwaste to stockpile for protection of intermediate or final cap (Prov. Item)

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If instructed, this rate shall allow for all costs of Plant, Materials, Labour and Subcontractor costs required to mulch the greenwaste to stockpile at the transfer station for use as an environmental control measures on landfill faces.

This Provisional Item shall be paid per tonne as measured and recorded at the weighbridge (measured on delivery to site on the weighbridge

Item 3.5 Hazardous waste facility

Items 3.5.1 and 3.5.2 shall be measured and paid on a per kilogram basis. The rate shall include for all costs associated with cataloguing, storing, weighting and carting hazardous waste materials off site using a reputable service provider. The rate shall include for weighing of all hazardous waste materials removed from site including accurate record keeping. The rate shall also include an allowance to ensure that all regulations and legislation for hazardous waste disposal are followed.

Item 3.5.3 shall be paid on a monthly lump sum basis and shall include for all costs associated with storing, degassing and removing off site using a reputable service provider. The rate shall include for weighing of all materials removed from site including accurate record keeping.

These items shall be invoiced monthly with the Contractors claim, which shall include records of the different types of hazardous waste and weights of each materials removed from site in that period.

Item 3.6 Recovered resources and/or recycling

Item 3.6.1 shall be paid as a monthly Lump Sum and shall allow for all costs of Plant, Materials, Labour costs required for the acceptance, management, provision of and maintenance of all recycling receptacles, facilities and removal of recyclables from site (including arrangements with sub contractors).

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SECTION 4.0 LANDFILL MAINTENANCE

Item 4.1 General maintenance

Items a. to g. shall be paid as a monthly Lump Sum except for item c. which will be paid bi-monthly. The Lump Sums entered for maintenance shall allow for the cost of all Plant, Materials and Labour to inspect and maintain the landfill assets in sound working order, in a condition appropriate for their use and to the minimum standards as described in Clause 4.21 of this Specification. The rates or sums shall allow for all overheads, profit, inspections, record keeping, liaison with the Engineer and Council and all other incidental costs.

Item 4.2 Annual flushing of main leachate gravity line form the landfill toe bund to grit interceptor

This item will be paid as an annual Lump Sum. The rate shall include for the cost of all Plant, Materials, Labour and subcontractor costs to inspect and flush all manholes located on the main leachate gravity line from the toe of phase 2 to the leachate grit interceptor as specified in Clause 4.21.14 of this specification. The rates or sums shall allow for all overheads, profit, inspections, record keeping, liaison with the Engineer and Council and all other incidental costs.

Item 4.3 Clean out of leachate grit interceptor

This item will be paid as a Lump Sum. The rate shall include for the cost of all Plant, Materials, Labour and subcontractor costs to clean out the leachate grit trap interceptor as specified in Clause 4.21.14 of this specification. The rate shall also allow for cartage of the material to landfill. The rates or sums shall allow for all overheads, profit, inspections, record keeping, liaison with the Engineer and Council and all other incidental costs.

Item 4.4 Maintenance of all on-site erosion and sediment controls

This item shall be paid as a monthly Lump Sum. The rate shall allow for the cost of all Plant, Materials and Labour to inspect and maintain the site erosion and sediment controls as required by the Specification, Erosion and Sediment Control Plan and Landfill Operator Management Plans. The rates or sums shall allow for all overheads, profit, inspections, record keeping, liaison with the Engineer and Council and all other incidental costs.

Note this rate shall exclude removal of silt from the main landfill stormwater silt retention pond.

Item 4.5 Supply, operate and control pest control traps (feral cats, rats, possums etc)

This item shall be paid as a monthly Lump Sum. The rate shall allow for the cost of all Plant, Materials and Labour to inspect, place and service suitable trap to control pests at the landfill. The rates or sums shall allow for all overheads, profit, inspections, record keeping, liaison with the Engineer and Council and all other incidental costs.

Item 4.6 Provision of litter screens and clearing of litter as specified

This item shall be paid as a monthly Lump Sum. The rate shall allow for the cost of all Plant, Materials and Labour to provide litter fences and litter collection to meet the requirements of Clause 4.13 of this specification. The rates or sums shall allow for all overheads, profit, inspections, record keeping, liaison with the Engineer and Council and all other incidental costs.

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SECTION 5.0 DAYWORKS

Item 5.1 Labour (Prov. Items)

The rates for Labour on Daywork are rates at which payment will be made for labour employed on Dayworks on the instruction of the Engineer. Payment will be made in respect of the actual hours worked by the labour.

The rates allow for taxes, pensions, training, travelling time, insurances, holiday pay, payment in respect of time loss due to inclement weather, executive superintendence, the use and maintenance of all small tools not classified as plant, all establishment charges, profit, overheads, and any other payments which the Contractor may be required to make to the workers under the relevant employment agreements. Plant operators are included for under the rates for Plant.

Provisional quantities have been provided for the number of hours that may be worked.

Item 5.2 Plant (Prov. Items)

Payment for Plant shall be the actual hours worked by a nominated item of Plant in accordance with the Engineer's Daywork directions, multiplied by the rate for that item of Plant as entered into the Schedule of Prices. The rates will apply whether the Plant is already on-site or brought to the Site on the Engineer's instruction.

Full payments for working Plant shall only be for the actual hours worked. In the event that Plant is brought to the Site on the written instructions of the Engineer and used only for Daywork, the cost of haulage to and from Site will be paid to the Contractor net. Where such Plant brought to the Site is retained on standby on the Engineer's instruction, a standby rate equal to 60 per cent of the full Contract Rate applicable in terms of an 8-hour Working Day and five (5) day Working Week, will be payable. The rates for Plant are for use of the Plant inclusive of all fuel and consumable stores, overhauls, repairs and replacements, and for haulage to and from the Site (except as stated above) and inclusive of operator.

The time necessarily spent in moving Plant within the Site as a result of the Engineer's direction to use it on Daywork shall be added to the actual hours worked provided that no time spent in moving for purposes of maintenance, repair or refuelling shall be added.

A Provisional Sim has been provided for the use of Plant, instructed by the Engineer, not listed in the Schedule of Prices. The rates for Plant instructed under this item shall be the applicable rates in the current Civil Contractor’s New Zealand (CCNZ) Bluebook adjusted by a percentage nominated in the Schedule of Prices by the Contractor.

Item 5.3 Materials (Provisional Sum)

A Provisional Sum has been allowed to cover the net cost of Materials used on Dayworks. Payment for Materials will be certified and paid for on the net cost of the Materials and the net quantities and weights of the materials actually used in accordance with the Engineer's instruction.

The percentage rate entered in the Schedule of Prices provides percentage additions to the net cost of Materials used on Dayworks and allows for all overhead charges, profit and all incidental costs.

The percentage addition will apply to all Materials delivered to Site and instructed by the Engineer to be used in Dayworks. The net quantities and weights actually used in accordance with the Engineer's instructions only, will be certified and paid for, together with any material necessarily and unavoidably cut to waste with the Engineer's knowledge and any surplus material which the Contractor is unable to use for its own use and which the Engineer instructs to be delivered to the Principal's store.

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SECTION 6.0 UNSCHEDULED OBLIGATIONS

The cost of any item not specifically referred to in the Schedule of Prices is spread over and included in the price or prices for other items in the Schedule of Prices which are most closely appropriate for the work not specifically referred to.

No claims will be entertained on the basis of omissions of items from the Schedule of Prices which are shown on or to be inferred from the Drawings or which are referred to in these Specifications or which are an integral part of an item measured or referred to in the Schedule of Prices.

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Schedule 21 – Schedule of Prices

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s7(2)(b)(ii)

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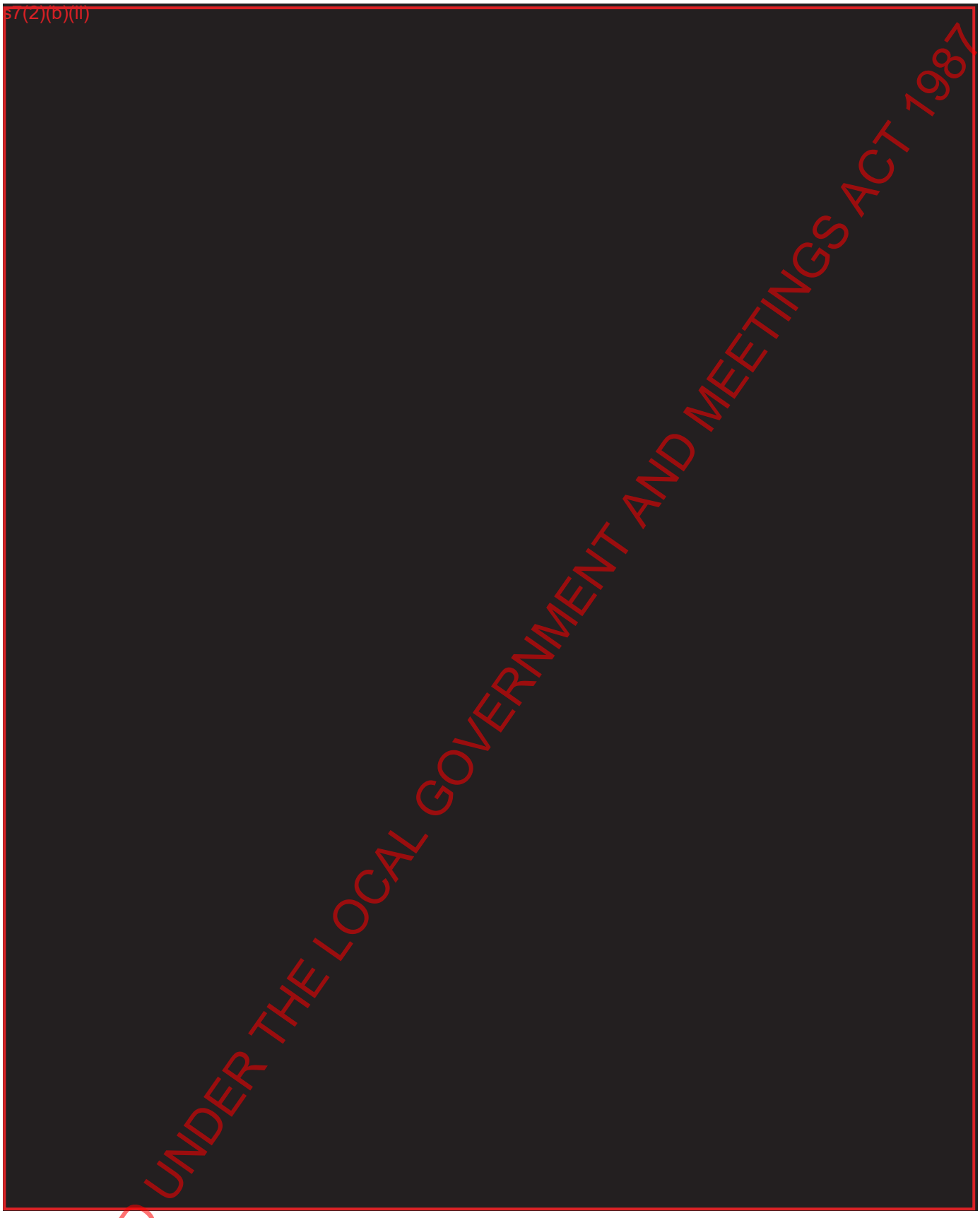
s7(2)(b)(ii)



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Schedule 22 – Specification

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Tonkin+Taylor

Silverstream Landfill Operations Contract: Specification

Prepared for
Hutt City Council | Te Awa Kairangi
Prepared by
Tonkin & Taylor Ltd
Date
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1 General

1.1 General and Location

This specification forms part of the Contract Documents for the operation of the Silverstream Landfill for the term defined in the Conditions of Contract.

Silverstream Landfill (Landfill) is owned by Hutt City Council and is located on Reynolds Bach Drive on the boundary between the cities of Upper Hutt and Lower Hutt. It comprises of a steep bush clad valley screened on all sides from public roads and developed areas. The site covers approximately 94 hectares of which approximately 30 hectares is utilised by landfill operations. Refer to drawing 82948.1000-010 for a site layout plan.

1.2 Contract Works

The Contract Works comprises the overall management and operation of the Silverstream Landfill in accordance with the Drawings, Specifications and Conditions of Contract. The Contract Works do not include the construction of new Stages within the Landfill but may, from time to time, include some engineering capital works as instructed by the Engineer.

1.2.1 Scope of Contract Works

The Contract Works comprise the following main areas of activity:

- Receipt of all acceptable refuse and recording of quantities;
- Collection of fees and management of customer accounts;
- Operation and maintenance of the Transfer Station including the public drop of area, management of recyclables and a hazardous waste disposal area (public drop off facility), for at least two years after which the Transfer Station may be closed, refer Section 4.3;
- The operation and maintenance of Landfill facilities and infrastructure, including access roads, signage, surface water and leachate drainage systems, including (without limiting the foregoing) the buildings, the weighbridge and associated kiosk, grassed areas, fences and gates;
- Construction of temporary and permanent access roads on the Landfill;
- Compliance with the requirements of the conditions of resource consents for the operation of the Landfill and all other relevant regulations and statutory requirements;
- Interfacing with other Separate Contractors on site (i.e. power plant and capital works contractor);
- Construction, operation and maintenance of erosion and sediment controls to comply with the Resource Consent Conditions;
- Receipt of waste and placement, compaction and covering in the Landfill;
- Maintenance of the landfill surfaces, including (but not limited to) intermediate and final cap, grassing, mowing and weed control and on-site borrow areas;
- Maintenance of the sediment pond and dam;
- Consult, coordinate and cooperate with Separate Contractors employed by the Principal to carry out work at the Site to facilitate their safe and efficient undertaking of their contracted works;
- Site security;
- Control of nuisances, including (but not limited to) odour, fugitive landfill gas, fugitive leachate, litter and pests;

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- Complaints management;
- Preparation of Operator Management Plans an reporting, refer Section 5;
- Engagement with Councils Broader Outcomes and wider objectives, refer Section 7;
- From time to time, some engineering capital works such as surface water drainage, erosion and sediment controls and final capping, may be instructed by the Engineer as a Variation. However, the Principal reserves the right to appoint Separate Contractors to carry out such work;
- From time to time, the Principal may instruct the Contractor to carry out work at the Landfill employing a sub-contractor to do the works e.g. new permeant roading, landfill upgrades or reseal of access roads;
- From time to time, provision of assistance (plant and materials) to other Separate Contractors to help them carry out work for the Principal on the Landfill site may be instructed by the Engineer.
- The responsibilities of the Contractor shall include all of the tasks allocated to the 'Landfill Operations Contractor' in the Landfill Management Plan, including responsibilities set out in this Specification and the Contract Documents.

1.2.2 Works Outside of the Scope of Contract

The following work is not included in the Contract (undertaken by a Separate Contractor):

- Major maintenance or rehabilitation of existing site facilities including buildings, services and roading.
- Capital works associated with the continued operation of the landfill, comprising;
  - Bulk earthworks to form benches and batter slopes for new cells;
  - Liner construction; and
  - Associated works for capital development, including realignments of the leachate and stormwater networks.
  - Relocation of gas collection and conveyance infrastructure to allow for capital development, such as the ring main.
- Works associated with the landfill gas collection system, power station, gas field maintenance and gas destruction (undertaken by a Separate Contractor);
  - Operation and maintenance of the gas plant and power station.
  - Installation and maintenance of gas wells;
  - Installation and maintenance of the gas pipes; and
  - Balancing and maintenance of the gas field.

1.2.3 Landfill Management Plan

The LMP is a stand-alone document which forms part of the Contract Documents, which may be updated from time to time to stay current with best landfill practice. The operational responsibilities of the Contractor in relation to the Landfill are set out in both this Specification and the LMP.

The Contractor's obligations pursuant to the LMP are identified as being obligations of the Landfill Operations Contractor.

The LMP shall be read with and shall, to the extent of the Landfill Operations Contractor obligations identified in the LMP, form part of these Specifications.

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The Contractor shall comply with and constantly achieve the Landfill Operations Contractor requirements of the LMP. The Contractor shall also carry out the Contract Works in accordance with the applicable requirements of the whole LMP.

1.2.4 Erosion and Sediment Control Framework

The Erosion and Sediment Control Framework (ESCF) is a stand-alone document which forms part of the Contract Documents (Schedule 29), this document may be updated from time to time as the landfill develops, technological changes and practical experience. The ESCF provides information to the Contractor to assist them compile a standalone Erosion and Sediment Control Plan.

Refer also to section 5.1 regarding Landfill Operator Management Plans.

1.3 Resource Management Act and Consent Compliance

The Principal has obtained Resource Consents from the Wellington Regional Council for the Contract Works (the Landfill Resource Consents).

1.3.1 Resource Consents

The Contractor shall execute the Contract Works in accordance with the Resource Consents (and any further Resource Consents which relate to the Contract Works) and shall abide by and fulfil all conditions and requirements that:

- Are expressly or impliedly the obligations of the Contractor; and
- Are expressly or impliedly the obligations of the Principal other than the Principal's resource consent obligations as set out in these Specifications.

A full list of the resource consents held by HCC for the Landfill is provided in the LMP (Section 1.9) and copies of the Consents provided in Appendix A of the LMP.

1.3.2 Contractor Obligations

The Contractor shall:

- Immediately advise the Principal in writing as to any notification of any application, plan change, or other matter received or of which the Contractor has become aware which relates to or may affect any of the resource consents;
- Comply with all enforcement orders, abatement notices, or other requirements issued to the Principal or the Contractor under the Resource Management Act 1991 or any other law relating to the protection of the environment, hazardous material or public health or safety which relate to the execution of the Contract Works; and
- Put in place and duly carry out procedures which shall adequately monitor compliance with all resource consents relating to the execution of the Contract Works.

1.3.3 Breaches of Consent Conditions

The Contractor shall pay all fines and penalties arising from all breaches by the Contractor of the Contractor's obligations under the resource consents whether such fines or penalties are imposed on the Contractor or the Principal or any Separate Contractor. The Contractor shall, on receipt of written demand from the Principal pay the amount of any such fine or penalty imposed on or otherwise paid or payable by the Principal to such person.

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1.4 Historical Waste Quantities

Expected waste quantities to be received at the Landfill may be estimated from the quantities received in previous years. Total waste quantities received in the period 2011 to 2020 are given in the table below. The table provides waste quantities over the weighbridge for both commercial and domestic (refuse transfer station) waste streams.

Table 1.1: Historical landfill tonnages

Year	Total refuse to landfill (tonnes)	Contribution from refuse transfer station (tonnes)	% of refuse transfer station tonnage against overall landfill tonnage
2011	92,048	18,988	21%
2012	85,793	18,025	21%
2013	112,654	18,755	17%
2014	128,288	18,717	15%
2015	116,211	18,792	16%
2016	124,560	20,059	16%
2017	120,280	21,136	18%
2018	123,793	22,092	18%
2019	143,332	22,881	16%
2020	152,524	21,393	14%
2021	150338	22,314	15%

A detailed breakdown of types of waste received at the landfill is provided in Appendix A. The Contractor shall make its own assessment of the likely waste quantities over the Contract Works Period. It should be noted that it is anticipated landfill volumes will decrease in response the Governments Landfill Levy program.

1.5 Landfill Development and Programme

The overall landfill development consists of 5 phases which are shown in drawings 82948.1000-022 & 023, refer for details.

1.5.1 Landfill Development Programme

The ten-year indicative capital development and operational filling programme is outlined in Table 1.2 below.

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Table1.2: Indicative Landfill Development Programme

Phase	Slope	Capital Development	Operational Filling	Comment
1	1 to 3	Complete	Complete	
2	4 to 8	Complete	Complete	
	Slope 9	2020-2021	2021 to 2023	
	Slope 10	2021-2023	2023 to 2025	
	Slope 11	2024-2025	2025 to 2027[1]	[1] Phase 2 Slope 11 is still to be confirmed.
3	Enabling work	2024 to 2026[2]	N/A	[2] Enabling work will be brought forward by two years if slope 11 does not go ahead.
	Slopes 1-2	2026 to 2027[3]	2027 onwards	[3] Slopes 1 – 4 and Operational filling for Phase 3 will be brought forward by 2 years if slope 11 does not go ahead.
	Slope 3	2027 to 2028		
	Slope 4	2028 to 2030		
4 &5	TBC	TBC	TBC	

1.5.2 Phase 3 Access

The term of this contract will extend into phase 3 of the and so it is anticipated that the Contractor will be required to operate both phase 2 and phase 3 during the initial filling of phase 3 slope 1. A 30% design has been developed to provide access to Phase 3 and details of this design are shown on drawings 82948.1000-030, 031 and 32, refer for details. Refer also to Section 4.4.2 of this Specification regarding the phase 3 filling operation.

1.5.3 Operational Filling Sequence

Operational filling plans for the filling of stage 2 phase 2, Slopes 9 and 10 has been developed, refer to drawings 82948.1000-020 & 021 for details. The Contractor is responsible for filling to these contours and will check fill profiles by use of survey control as required under Section 4.8 of this Specification. The Engineer will provide set out models for survey purposes. The Contractor will

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review the set out model and advise the Engineer if there are any ambiguities in the model prior to adopting for use on site. The Contractor is responsible for developing the fill sequence in which each slope is filled to the design contours in the set out model and shall submit details of that fill sequence to the Engineer for review and approval.

1.6 Health and Safety

1.6.1 Health and Safety Management and Documentation

The Contractor has the responsibilities of a Person Conducting a Business or Undertaking (PCBU) in relation to the carrying out of the Contract Works and the Site, refer also to Section 1.8 of the LMP. The Contractor is the PCBU with the most influence and control over the workplace and shall therefore assume responsibilities consistent with those of a Lead Contractor as described in 'Good Practice Guideline – PCBU's Working Together, WorkSafeNZ June 2019' and Figure 1. This shall include coordinating and communicating the on-site hazards, rules and procedures to everyone who accesses the Landfill site and consulting, cooperating with and coordinating activities with Separate Contractors (PCBUs) employed by the Principal to work at the Landfill site, the landfill gas operator and other users of the Landfill.

The Contractor shall put in place a Site Specific Safety Plan (SSSP) and Site Hazard Identification Schedule specific for the Contract Works, prior to the Date of Commencement in accordance with the Health and Safety at Work Act 2015 (HSWA) and its Regulations and the requirements of the Contract documents. (Refer also to clause 5.17.2 of the General Conditions.)

The Contractor's SSSP shall include:

a. Contract description.

b. Appoint a suitably qualified health and safety manager and outline the percentage of time committed to this project.

c. The identification of a suitably qualified and experienced full-time on-site Safety Supervisor and identification of other nominated safety and first aid personnel including responsibilities.

d. The Contractor's (PCBU's) health and safety policy, processes and procedures, including management structure and accountabilities for health and safety at work.

e. A register of specific site hazards and associated risks and controls implemented to eliminate or minimise them. There shall be provision made in the SSSP for a regular risk review of site hazards and associated hazard control measures.

f. Details of how the Contractor (PCBU) will communicate to their employees both general and site-specific hazards, the means of mitigation and the method of continual monitoring and recording of employees' knowledge of and protection from such hazards. This to include but not be limited to procedures for training staff in the proper use of work equipment and management of potentially hazardous substances.

g. Safety of Landfill users, the public and other workers.

h. Details of how the Contractor (PCBU) will communicate the on-site hazards, rules and procedures to users of the Landfill and others accessing the Landfill.

i. Details of how the Contractor will consult, cooperate with and coordinate activities with Separate Contractors and users of the Landfill including direction and management of Landfill users at the tipping area.

j. Details of how the Contractor will consult, cooperate with and coordinate activities with Subcontractors to develop their site-specific health and safety plans and how their activities will be monitored.

k. Contract induction and safety training including specific training related to the Contract.

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l. Specific safe work practices and procedures based upon Job Safety Analyses (JSA).

m. The manner by which the requirements of the HSW Act will be met i.e. workplace inspections, hazard identification and assessment, health and safety consultation, and emergency procedures.

n. Procedures for monitoring the health of employees where they are exposed to hazards at work including asbestos (refer to the AMP).

o. Procedures for dealing with incidents that may occur at the Site including vehicle accidents.

p. Details of Personal Protective Equipment (PPE) to be provided to personnel carrying out the Contract Works.

q. Incident reporting and investigation.

r. Warning signs e.g. deep excavation, hazardous materials etc.

s. Marking and parking of plant and machinery.

t. Protection of contract works.

u. Health and safety performance monitoring.

v. Traffic management plan (if required).

A copy of the Contractor's SSSP, including site related training programmes and reporting arrangements shall be provided to the Engineer and another copy shall be kept on Site at all times for inspection by employees, Subcontractors, the Lead PCBU (this role shall be undertaken by the Principal), Landfill users, other site visitors and the Engineer. The Contractor shall also forward Health and Safety Plans for all on-site Subcontractors (if any) to the Principal along with the Contractors formal review and acceptance thereof.

The SSSP shall be reviewed and updated on an ongoing basis throughout the Contract Works Period to ensure ongoing compliance with the Contractor's health and safety obligations under the Contract documents, to the satisfaction of the Engineer.

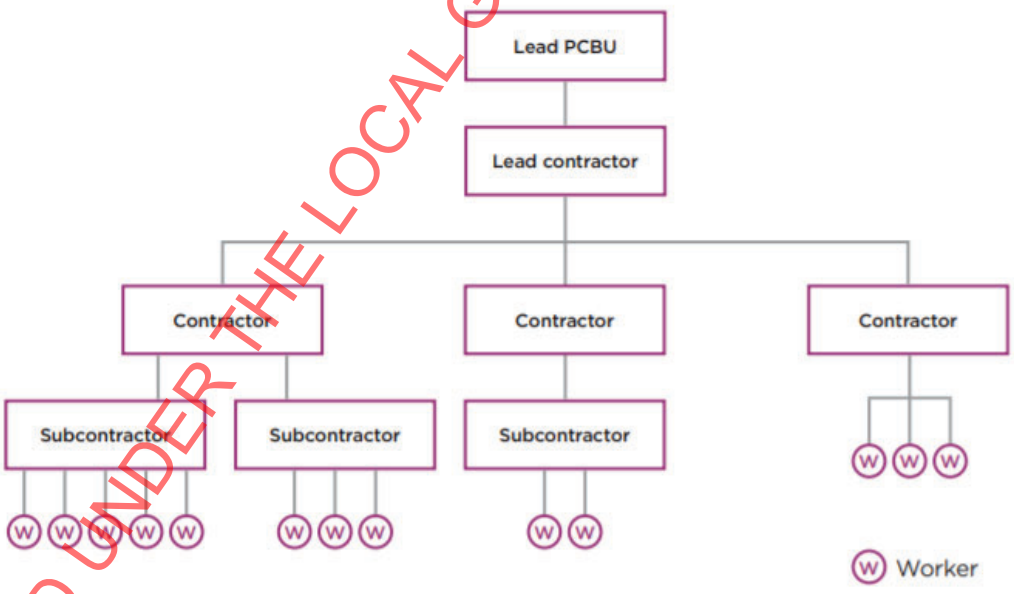

Figure 1.1: *Example of a contractual agreement (source: Good Practice Guideline – PCBU's Working Together. WorkSafeNZ June 2019)*

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1.6.2 Accidents

The Contractor shall notify the Engineer with written advice of every personal injury to its own and/or Subcontractor staff and other accidents or incidents that arise in connection with the carrying out of the Contract Works and/or the Contract including accidents involving Landfill users or visitors to the Landfill site and/or damage to property. Such written advice shall be provided to the Engineer within 48 hours of the accident happening.

1.6.3 Separate Contractors

There are multiple PCBUs (Separate Contractors) operating on the landfill including:

- The Landfill Operator
- The Capital Works Contractor
- The Gas Field and Power Plant Operator
- HCC and their consultants
- Earthlink

Earthlink operates in the refuse transfer station. Earthlink are an Incorporated Society, helping individuals to return to work by collecting items at the landfill and repairing those items for sale off-site. Refer also to Section 2.2 of the LMP for further details on Roles and Responsibilities of the Separate Contractors who operate on site.

The Landfill Operator shall coordinate all landfill operational activities with Separate Contractors. From time to time, such as for development of new cells, parts of the landfill will be given Possession off Site to Separate Contractors. This is a normal part of the landfill development and will not constitute a variation (unless, as a result of the activity of the Separate Contractor, the landfill operation has significantly changed).

From time to time Separate Contractors will be engaged to do work at the Landfill Site. These contractors may be working on site because:

- The Principal has engaged a Separate Contractor to carry out specific work; and/or
- The Separate Contractor engaged by the Principal may themselves engage subcontractors (e.g. a lining or roading subcontractor) to undertake some of the work on Site;
- A Separate Contractor engaged by the Principal may require access through the Site.

In all cases, where there are overlapping duties (refer Figure 1.1) there is a duty to consult, cooperate with and coordinate activities with all other PCBU's with whom duties overlap, so far as is reasonably practicable. The Contractor can enter into reasonable agreements with other PCBUs to ensure that each PCBU's health and safety obligations are complied with. The responsibilities for health and safety matters increases with the level of influence and control the Contractor has over a health and safety matter and the Contractor may apply requirements to Separate Contractor's work with the proviso that any such measures are directed at securing the safety of those working on the Site (for example, notification of works that may affect the gas extraction system).

The Contractor's SSSP will be given precedence at the Site and all other persons entering the Site must comply with the plan as a minimum. If additional hazards are created by other activities, these must be addressed within the second parties' health and safety plan before work is carried out.

The Contractor shall provide other parties working at the site with a copy of their SSSP.

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1.6.4 Health and Safety Site Briefing

The Contractor shall provide each person working on Site (own employees and employees of Separate Contractors and other authorised personnel visiting or undertaking work on the Site) with a H&S briefing/induction and provide an overview of their activities regarding H&S issues.

Without limiting the Contractor's responsibility to manage all H&S matters, the initial H&S briefing shall include instruction about but not be limited to:

- Hi-vis vests (to be worn at all times).
- Footwear to be worn (steel capped footwear where appropriate to the tasks being undertaken).
- Hard hats or other PPE to be worn where appropriate to the tasks being undertaken.
- No smoking.
- On-site hazards relevant to the work being undertaken and associated hazard control or mitigation measures (e.g. potential H&S risks associated with landfill gas discharges, risks associated with asbestos if involved with asbestos disposal work, etc.).
- Work to be undertaken only by those with appropriate licences for certain activities (e.g. bulldozer driving or electrical work).
- Need for vaccination against Tetanus, Hepatitis A and B (If appropriate for the activity).
- Need for vaccination against pandemics (such as COVID-19) and the requirement for evidence of vaccination status (this will also depend on specific company policy and direction from the lead PCBU, Hutt City Council).
- Washing of hands before eating or drinking.
- Signing in and signing out procedures for people working on the Site.
- Presence of the asbestos disposal area and prohibition of entry unless working on asbestos disposal.

1.6.5 Security

The Site shall be kept in a safe and secure condition at all times during the Contract Works Period. Gates in any security fence shall be locked at night and over weekends, and security fences will be maintained intact. CCTV cameras and recording equipment shall be operated at all times.

1.6.6 First Aid

The Contractor shall provide a fully equipped first aid kit which is maintained to deal with accidents and ailments, which are likely to occur on the Landfill Site during the Contract Works Period. The first aid kit must be local to work activities being undertaken.

1.6.7 Hygiene

The site is an active landfill. As such, putrescible and unsanitary materials are commonplace on the site and are not necessarily confined to the landfill operating area (for example, contaminated plastic and paper might be blown around the Site). Leachate seepage also occurs at points around the Site. Therefore, personal hygiene is important. Workers shall wear gloves, and as necessary, dust masks, in areas where direct contact with potentially contaminated materials is considered possible. Also, all workers shall wash their faces and hands thoroughly prior to meal breaks, and the Contractor shall confirm to the Engineer that specific procedures to ensure this requirement are complied with.

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1.6.8 Landfill Gas

Uncontrolled leakage of landfill gas may occur at the Site and will be present in the construction or raising of gas wells and in other works on the gas system (by others). Landfill gas is also likely to be present in low-lying areas such as poorly ventilated drains and culverts.

Landfill gas poses a health risk due to possible methane ignition or explosion or asphyxiation in carbon dioxide-enriched air. This risk is increased when working in confined spaces.

The Contractor shall take special care and be vigilant in all areas where refuse is to be exposed or when well drilling, pipelaying and manhole related work is involved.

All trenches, wells, leachate sumps, manholes and culverts shall be treated as confined spaces. Workers entering or working near these confined spaces shall observe procedures outlined in Worksafe publication "Confined spaces: planning entry and working safely in a confined space" and "Australian Standard AS2865 Confined spaces".

Atmospheric testing equipment shall be supplied by the Contractor and shall be used on site before entering confined spaces or opening of manholes to determine whether they are safe.

Smoking is prohibited on the Site, and any fire on the Site shall be treated as an emergency and extinguished immediately.

1.6.9 Failure to Comply

Should the Contractor fail to comply with the requirements of these Specifications or the provisions of the SSSP including a JSA or safe work procedure, (and without negating the Contractor's primary H&S obligations) the Engineer may instruct the Contractor in writing to:

- Suspend the progress of the whole or part of the Contract Works, and then,
- Advise the Engineer in writing within 24 hours of the time of notification what actions have been taken or are proposed to ensure that the Contractor's operation will comply with the Site Specific Safety Plan.

Where, as a result of the Contractor's operations the Engineer initiates the above actions, the costs of doing so incurred by the Principal shall be payable by the Contractor.

1.6.10 Hazards identified by the Principal

The list of significant hazards identified below are considered by the Principal to relate to this contract. Note that the list may not be complete, and it is the responsibility of the Contractor to adopt these hazards and ensure all significant hazards relating to the Contract Works are considered in the Contractors Site Specific Safety Plan (Section 5.1.1).

Table 1.3: Hazards identified by the Principal

Hazard	Risk
Landfill plant – Active landfill area	Injury from vehicle collisions with other vehicles or pedestrians.
Landfill traffic – Landfill roads	Injury from vehicle collisions with other vehicles or pedestrians.
Operation of landfill equipment e.g. compactor, dozer and excavators.	Crushing and pinching injuries.

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Hazard	Risk
	Slips and trips from mounting, dismounting, access for servicing
Overhead cables – access road	Electrocution resulting in death or serious injury from live cables
Underground cables and services pipes etc.	Electrocution resulting in death or serious injury from live cables. Particular risk from compaction and excavation work
Noise	Health risk from high noise levels Collision injury if audible alarms cannot be heard
Odour	Health consequences if persistently exposed to obnoxious odours Potential for inhalation of harmful gases
Dust	Inhalation of harmful dust
Pathogens and contaminants (landfill waste / leachate)	Risk to health
Asbestos and other special/hazardous wastes	Risk to health
Unidentified hazardous waste	Risk to health
Sharp objects in waste/on landfill surface	Lacerations and other injuries
Uneven ground / trip	Slips, trips and falls
People or vehicle falling over in tip face	Injury from falling Smothering by falling or pushed materials Injury from vehicle falling
Other contractors	Lack of co-operation, consultation and collaboration can cause injury from a clash of activities
Steep slopes (landfill)	Death and/or Injury from vehicle collisions, overturning or loss of control on slopes
Steep slopes (land around landfill)	Death or injury from slips, trips and falls
Soft ground (especially landfill waste)	Death and/or Injury from overturning vehicles resulting from instability caused by soft ground e.g. tipping trucks Stuck vehicles and other equipment
Water (storm water and leachate ponds)	Drowning Health risk (leachate)
Fire	Injury or death Respiratory injuries Property damage

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Hazard	Risk
	Interruption of services from long term burning
Gas system	Injury from fire and explosion from uncontrolled gas leaks Injury or death from toxic gases Injury or death from asphyxiation
Landfill gas from waste	Injury from fire and explosion from uncontrolled gas emission Injury or death from toxic gases, particularly in confined spaces Injury or death from asphyxiation, particularly in confined spaces
Strong sun	Short term risk of sunburn – long term risk of melanoma
Strong winds	Injury from flying debris
Working remotely or in isolation	No one available to help if worker injured, trapped, unconscious, or incapacitated.
Weighbridge	Collision with barriers fences Slips trips and falls
Children	Risk of injury to children if brought on site in delivery vehicles
Lack of familiarity of drivers delivering waste with the site and site rules	Unexpected and potentially unsafe behaviour
Unsecure loads in waste delivery vehicles	Injury from falling or blown materials from vehicles Waste in areas where no controls in place

1.7 Contractor's Documentation and Written Correspondence

1.7.1 Acceptance of Contractor's Documentation

The Contractor shall provide the documentation required by this Specification to the Engineer for review not later than 4 weeks prior to the Date of Commencement.

On receipt of each plan, the Engineer shall make immediate and formal acknowledgement of its receipt to the Contractor, and in the next ten (10) Working Days, the Engineer will advise acceptance of the plan or advise of indicative amendments that are required.

Each plan shall be revised and resubmitted for formal acceptance and shall be finalised prior to the Date of Commencement.

The Landfill Operations Plan (including sub-plans) shall be subject to the approval of the Engineer and shall be reviewed and re-issued annually within one month of the anniversary of the Date of Commencement.

During the Contract Works period the Engineer and the Contractor will review the plans and monitor that the requirements of the Contract are continuing to be met.

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The Engineer has the right to make comment or require amendments to the plans at any time.

1.7.2 Written Correspondence

All contractual correspondence shall be exchanged between the Engineer and Contractor by way of sequentially numbered Notice to Contractor (NTC) and Notice to Engineer (NTE) respectively. The Contractor and Engineer shall maintain a register of such notices.

The Contractor shall not undertake any works discussed between the Engineer and Contractor until this work has formally been confirmed via NTC. Refer also Clause 9.2 of the Specific Conditions of Contract – Other Conditions of Contract.

1.8 Drawings and Figures

The following drawings form part of the Contract Documents:

- 82948.1000-001 Drawing List and Location Plan
- 82948.1000-010 Site Plan
- 82948.1000-011 Existing Leachate Network
- 82948.1000-012 Existing Stormwater Network
- 82948.1000-013 Existing Gas Collection System
- 82948.1000-020 Operational Filling Plan – Slope 9
- 82948.1000-021 Operational Filling Plan – Slope 10
- 82948.1000-022 Phase 1-5 Indicative Sequence Plan
- 82948.1000-023 Phase 1-5 Indicative Long Section
- 82948.1000-030 30% Phase 3 Access Design – General Arrangement Plan
- 82948.1000-031 30% Phase 3 Access Design – Stormwater Plan
- 82948.1000-032 30% Phase 3 Access Design – Longsection and Typical Cross Sections
- 82948.1000-040 Standard Details Sheet 1 of 3
- 82948.1000-041 Standard Details Sheet 2 of 3
- 82948.1000-042 Standard Details Sheet 3 of 3

Additional Drawings may be issued through the Contract Works period to provide information required to carry out the Contract Works (final fill levels, for example). The Contractor shall inform the Engineer immediately of any apparent errors, inconsistencies, or omissions in any of the Drawings pursuant to Clause 2.7.4 of the General Conditions. The Contractor shall maintain one full set of Drawings at the Site at all times.

1.9 Standard Specifications

The standard specifications referred to herein shall be deemed to be incorporated in these Specifications and shall apply to those clauses of these Specifications to which they are relevant. Reference to a standard specification refers to the latest edition at the date of closing of tenders and includes the latest amendments or revisions to that standard specification. The Contractor shall maintain on the Site a complete set of all standard specifications referred to in these Specifications.

1.10 Contractor's Working Area

The Contractor shall confine its operations to within the extent of the site boundary shown on the drawing 82948.1000-010 - Overall Site Layout Plan. The Contractor's Plant, materials and operational activity shall not pass beyond the limits shown.

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1.11 Survey by the Principal and Survey Stations

Refer also to Section 4.8 for details of survey to be completed by the Contractor.

The Principal will arrange quarterly drone surveys to:

- Confirm air void utilisation;
- Confirming fill profiles of refuse placed by the Contractor;
- Obtain updated topographical (LiDAR) and high quality aerial imagery;
- Assist with landfill development, planning and design work.

This data will be shared with the Contractor.

The Principal has established survey stations and other marks within and adjacent to the site from which the extent of the Contract Works can be determined. Details of these stations and benchmarks will be supplied by the Engineer to the Contractor as required. In case of any discrepancy between one benchmark and another, the ruling survey benchmark shall be as directed by the Engineer.

The Contractor shall take particular care to ensure that all survey stations are protected, until such time that they must be removed in order to allow the Contract Works to be completed. The Contractor shall give the Engineer 48 hours' notice before removing such benchmarks, so that the Engineer can establish new benchmarks if required.

Until such survey benchmarks are approved to be removed, the same survey benchmarks may be used by others and the Contractor shall take every reasonable precaution to ensure that no disturbance of them occurs. Should such disturbance occur or be thought to have occurred or should the Contractor consider a benchmark to be in error, the Contractor shall notify the Engineer immediately. If the survey benchmark has been disturbed due to the Contractor's activities, the Contractor shall reinstate the benchmark using a suitably qualified surveyor at the Contractor's cost. In the event that the Contractor desires to fix alternative and/or additional pegs for ease of setting out, the Contractor shall obtain the approval of the Engineer before installing such additional pegs. The Contractor shall be entirely responsible for ensuring and checking the accuracy of such additional pegs.

1.12 Cleaning Up and Reinstatement

During the Contract Works period the Site shall be kept clean and tidy, and any damage caused by the Contractor to any property or existing works or services (including those constructed by Separate Contractors after the Date of Commencement) shall be rectified immediately.

On the Date of Expiry or earlier termination of the Contract, the Contractor shall remove all temporary access or storage facilities, construction plant and debris, shall reinstate all surfaces damaged or degraded by the Contractor's activities to the condition as specified or otherwise in no worse condition than at the Date of Commencement (or immediately after their construction if constructed after the Date of Commencement) and shall leave the Site in a neat and tidy condition to the satisfaction of the Engineer.

1.13 Inspection and Approvals

1.13.1 Engineering Approvals

In addition to the requirements for inspection contained elsewhere in the Contract documents, the Contractor shall give the Engineer at least 2 Working Days' notice that he wishes to proceed with the

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following Contract Works in order that the Engineer may undertake inspections of the Contract Works:

a) Commencement of any engineering work.

b) Placement of any waste over a new area of the protection/drainage layer.

The Contractor shall not proceed to the next step of the Contract Works until the Engineer has inspected, approved and where necessary measured the Contract Works at the previous step.

1.13.2 Approved Materials

In all cases where plant or equipment of "approved" design or make is required by these Specifications and/or the Drawings, the Contractor shall obtain the approval of the Engineer in writing before such plant or equipment is constructed or ordered.

Where the Contract Documents require the Contractor to work in accordance with a given manufacturer's recommendations or requirements, the Contractor shall contact the manufacturer(s) and/or supplier(s) concerned, ascertain the relevant criteria and where appropriate arrange for the manufacturer's representative to be on Site while the relevant work is undertaken.

In all cases where a particular brand or product is specified, the Contractor may, subject to the approval of the Engineer, and at no additional cost to the Principal, substitute an alternative product or brand of the same kind, size and equal or better quality.

1.14 Plant and labour

At all times when the Landfill is open the Contractor shall provide sufficient competent and trained staff to direct vehicles and operate equipment. The Contractor shall provide relieving staff as required. At least one staff member on site at any time shall have the appropriate training and qualification to be the nominated Safety Supervisor.

The Contractor shall provide appropriate mechanical plant to effectively operate the Landfill in accordance with these Specifications. Plant for compaction of waste shall be a compactor designed specifically for the compaction of waste is covered under section 4.5 of the Specification. Plant for the shaping and compaction of the Landfill, quarrying borrow material, stockpiling operations and the placing of cover material shall be permanently located on Site.

In addition, other mechanical plant that may be needed on Site from time to time to meet the requirements of these Specifications shall be provided by the Contractor.

The Contractor shall provide for the maintenance of all Plant and all Principal owned buildings, structures, facilities and equipment (Facilities) within the Site. When any of the Plant and/or Facilities are unavailable because of breakdowns, repairs or maintenance for more than 48 hours, the Contractor shall at own cost hire or otherwise provide alternative plant to the satisfaction of the Engineer to ensure continuity of operations.

Contractor staff shall have a current driver's licence appropriate to the heavy plant they are operating.

1.15 Contractors Personnel

All personnel employed on the landfill site by the Contractor shall be required to wear an appropriate uniform approved by the Engineer. The uniforms are to be readily identifiable by the public using the Landfill. An approved uniform may consist of suitably coloured overalls, or wet weather clothing printed with appropriate wording.

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This wording shall include the Contractors name and the words “LANDFILL OPERATIONS” in prominent letters.

All kiosk staff shall wear an approved uniform and wear suitable identification. This will be negotiated with the Council but shall generally consist of neat trousers or skirt, shirt, jersey and/or jacket.

All personnel in areas where there is vehicle traffic shall wear high visibility vests or similar.

1.16 Complaints

All complaints received in respect of the landfill operation will be recorded in a Complaints Register maintained by the Contractor. The register shall record the following:

- The name and address of the complainant, if supplied;
- Identification of the nature of the complaint;
- Date and time of the complaint and alleged event;
- Weather conditions at the time of the alleged event;
- Results of investigations;
- Any mitigation measures adopted;
- Date of oral response; and
- Date of written response.

The Contractor shall respond to the complaint within the following times:

- An oral response within 24 hours of receipt;
- A written response within 48 hours confirming details of the complaint and what action is proposed or has been taken;
- A copy to the Engineer within 2 working days.

1.17 Contractor's Amenities

This section covers the provision of amenities for the Contractor's site staff and facilities.

1.17.1 Power Supply

The Contractor shall be responsible for meeting the cost of all electric power used on the site, excluding the landfill Gas Power Station and Capital Works Contractor, and shall arrange with the local power supplier in this regard.

The Principal has upgraded the power supply to the office buildings such that there is the ability to draw a 3 phase power supply (from the old administration building switchboard) to two service pits located in the footpath next to the new administration building. This power supply option, ducting and service pits are available to the Contractor to provide a power supply and charging point for charging electric vehicles.

1.17.2 Water Supply

The Contractor shall be responsible for minor maintenance of the existing main water supply line within the landfill site. This shall be limited to repair of leaking joints, valve packing, or hydrant glands, and reinstatement where necessary.

The Contractor shall be responsible for meeting the cost of all water used on the site in excess of the rate entitlement.

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1.17.3 Wastewater

Wastewater from the landfill facilities is discharged via the landfill leachate system to trade waste. Trade waste charges will be paid directly by HCC and are not the responsibility of the Contractor.

1.17.4 Telecommunications

A landline telephone connection is installed at the landfill. The direct line for the landfill is (04) 563 6952. In addition to this a copper ADSL connection is provided to service the administration buildings.

The Contractor shall be responsible for meeting the cost of all telecommunication services at the landfill.

1.17.5 Contractor's Facilities (provided by landfill owner)

Facilities provided by the Principal include:

- Administration building including offices, meeting rooms, mess room and sanitation facilities;
- Administration office car park;
- Observation deck;
- Kiosk and two weighbridges;
- Operations shed;
- Portacom for staff working at the transfer station; and
- Roading and pedestrian infrastructure.

The Contractor shall be responsible for providing and maintaining chattels required, internal and external cleaning and minor maintenance. This shall exclude structural repairs or other major repairs except where caused by the actions of the Contractor.

There is provision for two electric vehicle charging points in the footpath next to the administration building. While the charging points are not yet installed, all ducting has been installed and a 3-phase power supply can be taken from the switch board located on the side of the administration building.

1.18 Existing Landfill Services

Existing landfill services including stormwater, sanitary sewer, leachate and gas pipelines are indicated on the Drawings in Appendix A. However, the completeness and accuracy of the positions cannot be guaranteed, and the positions and depths of services shown on the Drawings are to be taken as approximate only. The Contractor is responsible for confirming the location of these services.

The Contractor shall proceed with all due care to avoid disruption to or damage to any of the services or utilities on the site and shall be responsible for the care of all utilities in accordance with the Conditions of Contract. Work required on any of the existing services as part of this contract will require liaison with the services owner prior to implementing the changes.

1.19 Public Relations, Advertising and Publicity

The Contractor shall not use or cause to be used any advertising or publicity matter, photographs, notice boards or other media in connection with the Contract Works without the prior approval in writing of the Principal.

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1.20 Protection of Adjoining Public and Private Property

The Contractor shall take all necessary care to prevent damage to adjoining public and private property. Any materials and waste or excavation material and rubbish dropped on public or private property shall be removed immediately. No materials or plant, buildings, rocks, earth, slurry, vegetation or other materials shall be placed or allowed to roll, wash, slide or blow across the extent of site boundary shown on Drawing 82948.1000-010.

1.21 Handover on Contract Expiry and Handover Report

1.21.1 Handover Obligations

The Handover Obligations are:

- Ensure the Contract Works which should have been carried out as at the close of business on the Date of Expiry have been properly carried out in accordance with the requirements of the Contract documents.
- Remove all Plant, tools, equipment, temporary fixtures, records, and signage owned by the Contractor.
- Hand over all Contract Information to the Principal.
- Ensure the Principal's name and logo is no longer displayed on any Contractor stationary, uniforms, vehicles or signage or in any other way that suggests the Contractor is providing the Contracts Works services to the Principal.
- Ensure the Landfill facility is handed over in good order and condition.
- Transfer to Principal (as requested by the Principal) all licence agreements, warranties and guarantees applying to the Landfill facility held by the Contractor.
- The provision of the Handover Report (refer Section 1.21).

1.21.2 Handover Report

On the Date of Expiry or on earlier termination of the Contract the Contractor shall provide a Handover Report to the Principal.

The Handover Report shall include:

- All outstanding Monthly reports as specified in the Contract Documents.
- An Annual Report for the year (or part year) ending on the Date of Expiry or date of termination of the Contract.
- A description of all outstanding tasks or work in progress in sufficient detail to allow the Principal to identify and progress such tasks.
- Identify and report to Council any known or potential hazards associated with the carrying out of the Contract Works and/or the Site.
- All records and information required to be retained and/or provided in accordance with the Contract documents; and
- All other information relating to the carrying out of the Contract Works as reasonably requested by the Engineer.

1.22 Smoking

The landfill beyond the kiosk is strictly a non-smoking area. The Contractor shall ensure this is adequately signposted at the Kiosk and shall request any person smoking within the landfill area to

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cease. Any person continuing to smoke shall be denied access beyond the kiosk barrier point, or if already beyond this point, requested to leave the site immediately. The Contractor shall record the details of any person continuing to smoke and supply these to the Engineer.

1.23 Dangerous Activities

The Contractor shall not do or suffer or permit to be done on the landfill facility anything which may constitute a nuisance, annoyance or danger to any person or property.

1.24 Separate Contractors

There are multiple Contractors operating on the landfill, including:

- The Landfill Operator;
- The Capital Works Contractor;
- The Gas Field and Power Plant Operator;
- Earthlink.

The Contractor is required to co-operate fully with Separate Contractors carrying out work on the same or adjoining sites as set out in Section 5.5 of the General Conditions of Contract. The Engineer may use Separate Contractors for work outside this Contract. In particular earthworks and drainage work in connection with the capital development of the landfill may be carried out on the site by Separate Contractors during the period of the Contract.

1.25 Control of Traffic and Signage

The Contractor shall prepare a traffic management plan (TMP) to meet the requirements of the Contract Documents and provide safe management of all traffic activities within the landfill. Refer to Section 5.1 for details.

The Contractor shall provide and operate all traffic signage and traffic management as required to comply with the TMP to direct and control public and commercial traffic within the landfill. This will include clear delineation of domestic and commercial traffic.

All signage shall comply with the Manual of Traffic Signs and Markings (MOTSAM, Waka Kotahi) and all traffic management shall comply with the Code of Practice for Temporary Traffic Management (CoPTTM, Waka Kotahi).

The Contractor is responsible for maintenance of all permanent traffic signage and line markings within the landfill site and on Reynolds Bach Drive uphill of the landfill gates. These shall be maintained regularly to meet Waka Kotahi Requirements.

The Contractor shall not use or cause to be used any advertising or publicity matter, photographs, tickets, signage or other means in connection with the contract works without the prior written approval of the Engineer.

As a minimum and not limited to, the Contractor shall provide the following landfill information signs:

Sign Description	Location
Landfill fees Vehicle weighing requirements	Access road approaching gate
Hours of Operation Conditions of entry	Front gate

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Tip stream is potentially contaminated and not suitable for recreation	Near tip stream and Boundary with Silverstream Christian Park
Speed limit Keep left Hazard identification - Road slippery when frosty	Access road to kiosk
Landfill fees Payment requirements (No Cash and Contactless)	Landfill kiosk
Speed limit Direction to landfill and Transfer station No unauthorized entry at loadout area and main commercial landfill access	Road between kiosk and roundabout and at the main landfill commercial access.
Hazard identification Private vehicles prohibited PPE requirements	Landfill active working face Asbestos area
Speed limit Direction of different waste stream drop off areas (ie.Greenwaste, Recycling, Household hazardous waste drop off etc.)	Transfer station/Recycling area
Hazard identification PPE requirements	Hazardous waste drop off facility

1.26 Environmental Protection

The Contractor shall programme their operations and construct the Works to ensure that they fully comply with the silt control methods outlined in the Greater Wellington Regional Council's (GWRC) 'Erosion and Sediment Control Guide for Land Disturbing Activities in the Wellington Region', February 2021and as per 5.1 of this specification.

The Contractor shall ensure all Work is carried out to comply with the Conditions of the landfill Consents, refer Section 1.3.1 of this Specification.

The Contractor shall take all practicable precautions to protect against sediment laden discharges to the stormwater receiving systems, especially in situations where unbound surfaces are exposed to erosive stormwater runoff.

If the Engineer or a GWRC/HCC Enforcement Officer advises that the existing controls are inadequate in terms of the GWRC guidelines and consent requirements, remedial actions shall be completed within two working days and prior to any forecast rainfall events.

In all areas where the Contractor intends to refuel plant or park plant overnight, such temporary stormwater contamination control provisions that will prevent pollution of stormwater courses or natural water are to be made. All contaminant storage or re-fuelling areas are to be bunded or contained in such a manner so as to prevent the discharge of contaminants to water or to land where it may enter water.

Hydrocarbons will not be permitted to drain to ground during any operation: all are to be collected in drain trays or collection vessels. Any soils that may have been hydrocarbon contaminated must be disposed of to the active tip face within 24 hours.

All machinery is to be thoroughly cleaned of vegetation (e.g. weeds), seeds or contaminants at least 10m away from any watercourse, water flow channel or stormwater system.

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The Contractor shall take all practicable steps to minimise adverse effects on water quality. Specifically the Contractor shall:

- Review weather forecasts and undertake a daily visual inspection of the weather to ensure earthworks are undertaken in suitable conditions; and
- Ensure that adequate stormwater provisions are in place to direct flow and prevent scour prior to any forecast rainfall.

1.27 Emergencies

The Resource Consent Conditions for the Landfill require the Landfill Management Plan to identify emergency procedures in response to natural emergencies and hazardous waste spills. Refer to Section 5 within the LMP for more detailed information.

The potential emergency events are as follows:

- Leachate in stormwater;
- Leachate in groundwater;
- Fire;
- Landfill gas discharges;
- Prohibited or undeclared hazardous waste;
- Earthquakes;
- Road accidents;
- Pandemic management;
- Landfill closure in event of emergency.

The daily inspections of the Landfill and the daily and monthly monitoring will be the most likely trigger for alerting of an emergency event.

1.27.1 Leachate in Stormwater

The most likely reason for leachate to appear in surface water is either an uncontrolled discharge from the landfill face or a leak or blockage in the leachate pipeline. The existence of leachate in stormwater is most likely to be identified by the daily conductivity testing of surface waters or the daily inspection of the leachate system and Tip Stream (refer Section 5.5). In response to a conductivity reading in excess of 500 µS/cm the Contractor shall:

a) Advise the Engineer or the Engineer's Representative
b) Immediately investigate upstream to identify the source
c) Adopt suitable procedures which shall include:
    - Diverting flow from the silt pond to the leachate pipeline;
    - Establishing appropriate measures to intercept the leachate at source;
    - Emptying and cleaning the silt pond;
    - Completing permanent repairs as necessary.

1.27.2 Leachate in Groundwater

The presence of leachate in the groundwater will be identified by the monthly groundwater monitoring which is outside the scope of this contract.

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1.27.3 Fire

EXTREME CARE is required to fight landfill fires. The following points shall be noted when fighting refuse fires and all site personnel must be advised of these factors:

- Underground fires may spread in any direction beneath the surface and can appear on the surface at random.
- The surface on which machines may be working can potentially be undermined by the fire.
- As methane gas production is continuous and certain mixtures of methane and oxygen are highly flammable, previously extinguished areas of refuse can re-ignite.
- The refuse can spontaneously ignite on exposure to air.

In the event of a fire at the site, the following general actions shall be taken by the Contractor:

- Ensure all personnel are safe and clear of fire source/vicinity.
- If fire is small, extinguish if safe to do so.
- Notify Fire Service (dial 111).
- Consider closing part or whole of landfill.
- Notify the Gas and Power Station Operator.

More specific actions may be required for fires in the refuse haul vehicle, an onsite building or in the landfill. Actions shall be identified in the Contractor's Site Specific Safety Plan (SSSP). To assist in preparing the Plan the Contractor may refer to the Silverstream Landfill Management Plan Section 5.3.

1.27.4 Gas Discharge

Where there is evidence that gas discharge is causing unacceptable on or off-site nuisance (or health risk), the site shall be inspected and, if possible, the source of the odour shall be identified. Gas discharge control shall be achieved by measures deemed appropriate by the Contractor. These measures include:

- Liaise with gas system operator;
- Upgrading intermediate cover and/or capping;
- Using a portable gas detector to identify possible gas sources on and off site;
- Minimising or halting excavation work in the Landfill;
- Sealing off potential sources of landfill gas (e.g. leachate manholes, areas where gas "shimmers" can be seen, checking and replacing seal at vent well penetration of the final cover layer).

1.27.4.1 Landfill Gas Hazard

The Contractor shall be aware that the Site is gas active, with high methane, carbon dioxide and occasionally high hydrogen sulphide concentrations having been recorded at the Site. The Contractor's Site Specific Safety Plan (SSSP) shall specifically address landfill gas hazard.

Health risk due to methane explosion or asphyxiation in carbon dioxide-enriched air is increased by working in confined spaces.

Confined space entry shall be avoided if possible. Any confined space entry shall be the subject of a specific H&S risk assessment by someone trained and competent in confined space entry and all relevant regulations followed.

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All trenches, manholes and pump station wet-wells shall be treated as confined spaces. Workers entering or working near these confined spaces shall observe WorkSafe procedures and guidance documents, including (but not limited to)the quick guide for 'Confined Spaces: planning entry and working safely in a confined space'.

Uncontrolled leakage of landfill gas may occur at this Site in many locations. Landfill gas is also likely to be present in low-lying areas such as poorly ventilated drains and culverts.

1.27.5 Prohibited or Undeclared Hazardous Waste

In the event that prohibited materials are brought to the site and/or found on the site, the following actions shall be taken by the Contractor:

- Advise staff and ensure all relevant safety procedures are followed;
- When prohibited or undeclared hazardous waste is found in either the domestic transfer refuse pit or active tip face, take steps to "isolate" the prohibited material from the general waste stream to ensure it does not get disposed of in the Landfill;
- Do not handle the prohibited waste;
- Notify the transporter of the prohibited material to the site, if known to determine the producer of the material;
- Determine the appropriate action required;
- Notify the Engineer or the Engineer's Representative.

Extreme care is required in dealing with prohibited materials. All landfill personnel shall be trained to recognise and constantly look for waste that could be potentially hazardous. Some hazardous waste tipoffs are:

- Warning labels on containers, drums, buckets, cans, crates and boxes;
- Leaking loads, liquids of any kind;
- Sludges or semi-solids;
- Powders;
- Vacuum/tank trucks;
- Any container that could contain hazardous waste;
- Any loads with unusual or unfamiliar or incomplete paperwork;
- Any load with extreme odours;
- Any drum with both ends still intact.

1.27.6 Earthquakes

The Contractor shall include in the Site Specific Safety Plan (SSSP) and Management Operating Plans (Section 5.1) for dealing with the effects of earthquakes, including medical assistance, landfill closure, damage assessment, repair and reporting.

The contingency actions for leachate in surface waters or in groundwater resulting from an earthquake are the same as described in Section 1.27.1 and 1.27.2.

1.27.7 Road Accidents

The Contractor shall include in the Site Specific Safety Plan (SSSP) provisions for dealing with road accidents within the site.

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1.27.8 Pandemic Management

Silverstream Landfill is an essential service. The Contractor shall include in the Site Specific Safety Plan (SSSP) and Management Operating Plans (Section 5.1) provisions for managing Pandemics (for example COVID-19). This shall include but not be limited to:

- Landfill operating procedures during the pandemic;
- Facilities open or closed to the public;
- Protection of the public (if site is open);
- Protection of landfill operational staff to ensure the continued operation of the landfill as an essential service;
- Temporary traffic management;
- Compliance with local and central government legislation and guidance documents;
- Compliance with any Pandemic Management Plan developed by the Principal.

The Contractor shall update and modify these provisions as appropriate in response to changing hazards, regulatory controls and guidance.

1.27.9 Landfill Closure in Event of Emergency

The Contractor shall include in the Site Specific Safety Plan (SSSP) and Management Operating Plans (Section 5.1) detailed contingency plans outlining the procedures for closing and evacuating the landfill in the event of an emergency.

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2 Landfill Assets

The Silverstream Landfill incorporates structures and improvements which are to be maintained to enable efficient operation of the landfill. These include:

- Entry gates
- Main sealed access road
- All weather access tracks
- Landscaped and grassed areas
- Buildings (inc associated services, refer 2.1)
- Plant maintenance shed
- Entry kiosk hutt and weighbridge (inc associated services, hardware & software)
- Public transfer station and hazardous waste disposal facility
- At grade loadout area for the transfer station
- Piped stormwater control system
- Overland stormwater system
- Stormwater silt retention pond (refer 2.3)
- Stormwater retention pond Dam
- Stormwater cut-off benches
- Perimeter stormwater drain and access road
- Piped Leachate drainage system
- Oil separator
- Stilling basin
- On site borrow areas

The Landfill Gas Power Station and the area inside the power station enclosure, the piping and associated gas wells are not the responsibility of the Contractor.

2.1 Buildings

The following buildings are on the landfill site for use by the Contractor:

- A modern administration building, constructed 2020.
- Kiosk hut;
- Operations shed;
- A plant maintenance shed;
- Portacom for staff working at the transfer station.

The buildings, plant maintenance shed and the kiosks will be made available for the use of the Contractor for the period of the Contract at no charge.

Use of the sanitary facilities and smoko room in the administration building by other contractors on site, shall be at the discretion of the Contractor, but it shall be made available to visiting Hutt City Council staff and the Engineer.

Any loss or damage to the Contractor's plant or equipment, whether stored in the buildings or elsewhere, shall be borne by the Contractor and/or his insurers.

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All buildings, sheds and rooms provided for the use of the Contractor shall be maintained at the contractors own expense in their original condition subject to normal wear & tear and to the following conditions:

- All buildings must be kept securely locked at all times if unattended.
- The Contractor shall maintain these buildings in a clean and tidy condition.
- The Contractor shall maintain all associated services in a fully operative condition.
- The Contractor shall supply all consumables required for the operation of the contract such as soap, towels, first aid supplies and other necessary items.
- Any damage to the buildings or associated services resulting from the Contractors actions or negligence shall be repaired at the Contractors own expense.
- The Engineer and Hutt City Council shall have right of access to the buildings at any time.

The Contractor shall not commence the erection or construction upon the premises of any building fixture or to make any alteration or addition to a building fixture or improvement upon the premises without written consent of the Engineer.

2.1.1 Kiosk and Associated Equipment

The Contractor shall keep the whole of the kiosk complex and its associated equipment in a good state of repair to the satisfaction of the Engineer. The Contractor shall operate a preventative maintenance program for all the equipment, building and services and enter into agreement with specialist contractors as appropriate. Copies of the agreements shall be provided to the Engineer on request.

The weighbridge mechanisms recording equipment is excluded from the Contractor's responsibilities for preventative maintenance and repair due to fair wear and tear. However, the Contractor will be responsible for all damage arising to these items from misuse by the Contractor and they shall be repaired by the Contractor to the satisfaction of the Engineer at the Contractor's expense.

2.1.2 Insurance of Buildings

All Council owned buildings will be insured against loss of damage (by Council), except that where loss or damage is the direct result of the Contractor's neglect or negligence, he shall be liable for the cost of any insurance excess.

The Council will not be held responsible for loss of income or inconvenience to the Contractor, nor be responsible for provision of temporary premises, where loss or damage to the administration building prevents its use. The Contractor shall carry his own insurance or make his own arrangements for this eventuality.

2.1.3 Cleaning of Buildings

The kiosk. Amenities building and surrounding areas are the "front door" to the Silverstream landfill and as such the Contractor shall pay particular attention to keeping these facilities in a very tidy condition at all times. The main access road and the weighbridge queuing lanes shall be swept on a daily basis and all visible litter removed. The grassed areas adjacent to the amenities building shall be mown at regular intervals so that it always presents a tidy appearance.

The Contractor is responsible for the regular cleaning of the whole of the amenities building and kiosks. Exterior cleaning will include the monthly washing of the amenities building to remove dust, and in the case of the kiosks, the fortnightly washing of the buildings to remove dust and vehicle exhaust deposits. The interiors of all buildings shall have regular cleaning to ensure a safe and hygienic working environment.

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Rubbish shall be removed from beneath the weighbridge weekly to ensure its accurate operation.

The plant repair shed shall be kept clear of rubbish, debris, and accumulated dirt or mud. It shall be cleaned after every use.

2.1.4 Additional Contractor Buildings

The Contractor shall not erect or place any other building or structure, temporary or otherwise, within the landfill facility, without the Engineer's written approval.

2.2 Roading Network

The roading network on site is shown on Drawing 82948.1000-010, Overall Site Layout Plan. The network comprises of four types as follows:

- **Main Access Roads**
  - This shall be defined as the sealed road from the lower gate on Reynolds Bach Drive through the kiosk to the new roundabout and main commercial access to the main landfill.
- **Secondary Access Roads**
  - This shall be defined as the access roads from the new roundabout and main commercial landfill access to the refuse transfer station and greenwaste areas.
- **All Weather Access to Tipping Area**
  - This shall comprise the temporary unsealed access road that runs between the tipping area and main access road.
- **Miscellaneous Access Tracks and Haul roads**
  - These tracks are unsealed tracks for haulage and/or maintenance of the landfill and are located both in stage 1 and stage 2.

Refer to Section 4.21 of this Specification for details of the Contractors maintenance responsibilities of the roading network.

2.3 Stormwater Retention Pond

The stormwater retention pond is located at the base of the valley beyond the long term landfill footprint. The pond has been designed as a retention structure for purpose of containment of leachate in the event of a spill (as part of the landfill emergency measures). The pond is not a sediment retention pond, nor should be relied on to that effect.

The dam is operated (by the Principal) in accordance with the 'Dam Safety Management System for Silverstream Dam', 'Module 2: Operation, Maintenance and Surveillance Manual'. A copy of this document can be provided to the Contractor.

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3 Kiosk

3.1 Function

The operation of the weighbridge and kiosk is the responsibility of the Contractor. The layout of the landfill is such that all incoming vehicles stop at the kiosk before proceeding to the drop off facility or landfill face.

The kiosk and weighbridges are located near the administration buildings as shown on drawing 82948.1000-010 Site Layout Plan.

3.2 Acceptance of Waste

The Contractor shall be responsible for ensuring all incoming waste to the landfill complies with 'Waste Disposal Guide at Hutt City Council Landfills' attached in Appendix C and that all special wastes have the required approvals in place (refer Section 4.9)

The Contractor shall note that incorrect disposal of special waste, sludge or hazardous waste may require the Contractor to recover such waste or carry out such works as are necessary to ensure their correct disposal at the Contractor's own cost. Any action required to deal with undeclared hazardous waste or unacceptable waste found in the landfill and any costs associated with properly disposing or removing such material from the landfill are the responsibility of the Contractor.

The Contractor shall ensure that a suitable communication system is in place and operable between the kiosk and staff at the landfill face and drop off facility. This will ensure that the kiosk staff can advise the landfill operators of any waste requiring special handling or suspicious loads which require further investigation.

3.3 Kiosk Management

The Contractor shall provide a customer-oriented service to address and resolve all enquiries from account customers and deal with disputed transactions. All account customers shall be provided with a full transaction report on a monthly basis.

The kiosk management duties and responsibilities of the Contractor include the following:

- The Contractor shall ensure that the kiosk attendants are available on the premises at all times that the landfill is open to the public.
- The Contractor shall be responsible for the supply of all consumable materials associated with the operation of the kiosk (e.g. receipt rolls, weighbridge dockets, etc), ensuring that at no time stocks become exhausted.
- The Contractor shall handle and investigate all complaints in a courteous manner, reporting to the complainant and to the Engineer, the action taken as may be appropriate to remedy the situation.
- The Contractor is required to maintain an effective communication link between the kiosk and other operational staff for both day to day operational requirements and for use in emergencies. A radio shall also be provided for visitor use around site and stored in the kiosk when not in use.
- The Contractor shall ensure adequate security arrangements are in place at the kiosk to safeguard the Contractor's own staff and members of the public.
- The Contractor shall comply with all government legislation regarding pandemic management (including but not limited to display of QR codes, distancing requirements, screens, PPE etc).

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- The Engineer shall be notified of any defects in the equipment, damage, or occurrence of any graffiti or vandalism at the kiosk.
- The Contractor's staff shall wear at all times while on duty in the kiosk complex an approved personal identification badge. Details of the badge and the information to be displayed shall be approved by the Engineer before the commencement of the Contract. The information shall include the Contractor's name, business phone number, identification photograph of the employee, name and job designation and validity date of badge.

The adequacy of staffing will be gauged against the following performance measures during normal business operation:

- At no time may there be a queue of vehicles from the kiosk window exceeding 10 vehicles.
- At no time should may any vehicle have to wait for a period exceeding five (5) minutes.

3.4 Weighbridge Records

Refer Section 4.4.3 of the LMP (2022 version)

The Contractor shall maintain an accurate up to date transaction database and shall:

- Ensure all waste transported to the landfill is accurately weighed at the weighbridge (all waste streams);
- Ensure all recyclables, hazardous waste material and greenwaste taken offsite are accurately weighed prior to leaving landfill;
- Ensure all transactions are properly recorded according to product detail;
- Ensure all product details are kept current;
- Check the integrity of the transactions on a weekly basis and amend the details accordingly.

A record shall be kept of the quantity and type of all waste accepted into the landfill in accordance with the following reporting requirements.

- Waste Levy – Measuring waste tonnages, Ministry for the Environment.
- Reporting requirements for industrial monofills, cleanfills and transfer stations, Ministry for the Environment.

Current product categories are shown on the Landfill Entry Records shown in Appendix A and may be varied from time to time by the Engineer or Principal. The above details shall be entered into a suitable computer based software computer system to meet all reporting requirements.

The current software used at the landfill is WeighTrax, which includes number plate recognition capability. The WeighTrax fee will be paid directly by the Principal.

A record shall be kept of daily reconciliation of the number of vehicles with the summary of computer transactions, the barrier arm tally, and the income received. A non-chargeable visitors log shall also be maintained.

3.5 Insecure Loads

Refer Section 4.4.2 of the LMP (2022 version)

A log of regular insecure load offenders shall be maintained and included in monthly reporting to the Engineer.

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4 Landfill Operations

4.1 Hours of Operation

The hours of operation when the landfill is open to the public and commercial customers are described in Section 4.1 of the LMP. The Engineer and Principal reserves the right to vary the opening hours. If the operating hours are altered by the Engineer or Principal, the Contractor shall be required to operate the landfill during these hours.

No public access to the Landfill is to be permitted outside these hours and the Contractor shall ensure the gates are securely locked whenever the Landfill is closed. Before leaving the site at the end of the working day, the Contractor shall ensure that all other persons and vehicles have left the Landfill.

The Principal will provide the Contractor with the required number of landfill keys.

4.2 Landfill Fees

Refer also to Section 4.4.4 of the LMP (2022 version).

All vehicles shall be charged on the net weight of waste deposited.

All fees and discounts are determined by Council and may be subject to change from time to time at the discretion of the Council. The Council may also negotiate special fees with specific parties. Any changes to the fees will be communicated in advance to the Contractor.

The Contractor shall be entirely responsible for ensuring that all landfill users are charged the appropriate fee and that all fees charged are passed on to Council. It shall be the Contractor's responsibility to ensure that all transactions are fully documented and can be accounted for. Appropriate audit trails must be an integral part of the methodology.

Payment of landfill fees shall include cash, credit card and eftpos. The Contractor shall be entirely responsible for all cash including transport by an approved security firm to the Bank. All waste charges accepted on credit shall be the responsibility of the Contractor.

The Contractor should note that any instance of deliberate falsification of cash receipts or vehicle numbers, or unauthorised alteration to the computer system, to deliberately bypass the fee collection procedures and payment of charges will result in the termination of the Contract.

The Contractors financial system shall be able to issue electronic receipts for entries and payments via email. Paper receipts shall not be printed without specific instruction from the Kiosk Operator for each transaction.

4.2.1 Banking

The Contractor shall open a trust account at an approved Trading Bank at least five (5) working days prior to commencing work on the site. The name of the account shall be "Silverstream Landfill Trust Account" or approved similar.

The operation of the account shall be the responsibility of the Contractor, who shall pay all bank charges and fees related to the operation of the account. Interest earned from the account will be payable to the Contractor.

The Council will direct debit the agreed revenue (total fees invoiced and collected in cash) from the landfill following receipt of the monthly audited financial reports from the Contractor. The trust account shall have sufficient overdraft facility to accommodate the monthly withdrawals of landfill revenue.

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The trust account shall remain open until the contract is complete or is terminated and shall be closed only on the written instruction of the Engineer.

4.2.2 Accruals

The Contractor shall submit the expected sum of their monthly claim to the Engineer for Council accruals by 5.00pm on the first working day of the month. It is expected that this is an accurate estimate of the scheduled and unscheduled works undertaken during the month, rather than a generic estimate based on annual costs.

4.2.3 Monthly Claim and Use of Provisional and Unscheduled Items

Refer to the Conditions of Contract for the terms of payment.

It is expected that the Contractor shall submit details of any unscheduled obligations and daywork items to the Engineer for review and approval prior to undertaking such works. The Contractor shall discuss use of any provisional items with the Engineer and seek the Engineers approval prior incurring costs against provisional items detailed in the Schedule of Prices.

It is expected that the Contractor undertakes due diligence to minimise occurrence of errors within their claim submitted. The claim shall include adequate details for provisional items, dayworks and unscheduled obligations to enable the Engineer to practically assess the claim. All invoices claimed as unscheduled obligations shall be attached for reference.

4.2.4 Customer Service

The Contractor shall provide a customer-oriented service to address and resolve all enquiries from account customers and deal with disputed transactions. All account customers shall be provided with a full transaction report on a monthly basis.

4.2.5 Customer Database

The Contractor shall establish and maintain an up-to-date customer database of all account customers and exempt customers, ensuring that all contact details and all vehicle details are kept current.

4.2.6 Transaction, Income and Reconciliation Report

The Contractor shall submit to the Engineer the following monthly reports in PDF and Excel format:

- Volumes and income received for each waste category received;
- Documentation from computer files, banking and tickets to verify income amounts; and
- Any discrepancies such as for barrier arm entries or cash amounts.

4.3 Transfer Station

The Transfer station forms Separable Portion 1 to the Contract.

4.3.1 General

The Silverstream Landfill operation includes an onsite transfer station where members of the public can dispose of domestic waste, domestic volumes of hazardous waste, greenwaste, e-waste and recycling. The Contractor shall operate the transfer station for the term defined in Section 4.3.2 and activities noted in Section 4.3.3.

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4.3.2 Operational Period of Domestic Transfer Station

As part of the Councils 'Interim Carbon Reduction and Climate Resilience Plan 2021-2031', Council intends to establish a new resource recovery park. Should this occur, the onsite domestic transfer station may close. The operational period for the existing on-site domestic transfer station is therefore as follows:

- Two (2) years guaranteed full operation of the transfer station from the Date of Commencement as defined in the Conditions of Contract.
- Thereafter, the operation of the of the transfer station shall become a Provisional Item and will be reviewed by Council. A Provisional Item will be included in the Schedule of Prices for the ongoing monthly operation of the transfer station beyond the original two year period.

Refer also to Cl 10.2A of the Special Conditions of Contract – Other Conditions of Contract.

4.3.3 Transfer Station Operation

Refer also Section 4.21 in the LMP (2022 version).

The Contractor shall be responsible for operating and maintaining the transfer station drop-off facility, associated pits, barriers, signage, surfaces and stormwater systems. The transfer station is a customer facing facility and shall be maintained to a high standard.

The Contractor shall receive waste from the general public in the waste pit and shall use suitable plant to push and load the waste onto a transfer truck in the at grade loadout area. The transfer truck will transport waste from the transfer station to landfill.

The use of heavy machinery in areas shared by the public in the transfer station should be minimised. No heavy plant (i.e. front end loaders, transfer truck, excavators) are permitted to operate in areas of the transfer station that are accessible to the public. Heavy plant may be used when clearing the waste pit, however, care must be exercised when operating in the waste pit to ensure that heavy machinery does not endanger the public when unloading waste or damage trailers or vehicles parked at the unloading ledge. This risk shall be addressed by the Contractor in the Contractors Site Specific Safety Plan (SSSP).

4.3.4 Transfer Station Facilities

4.3.4.1 Transfer Station Personnel

The transfer station is a public facing facility. To ensure that that a high level of customer service is provided, the Contractor shall provide one (1) full time equivalent 'Transfer Station Concierge' to oversee the transfer station operation. The responsibilities of the Transfer Station Concierge shall include:

- Guiding customers of the transfer station to the correct disposal location, and providing information on the right handling of relevant materials.
- Responsible for the hazardous waste drop off, including:
    - Undertaking and training in relevant H&S training re hazardous waste;
    - Identification, cataloguing and storage of hazardous waste;
    - Overseeing hazardous waste removal from site and ensuring that all material leaving the landfill is weighed.
- Ensuring greenwaste is clear from contamination (as far as practicable).
- Overseeing the greenwaste mulching and removal from landfill and ensuring that all greenwaste leaving the landfill is weighed.

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- Ensuring any traffic management is in place and being followed (if required, for example for pandemic response and social distancing).
- De-gassing of whiteware and gas cylinders (unless Subcontracted).
- Is a point of contact for fire and emergency.
- Ensuring the transfer station is clean and tidy at all times (i.e. remove any litter, mitigate spills).
- Monitor performance of the transfer station and reports any issues and areas for improvement.

The Transfer Station Concierge hours of work shall be a total of 40 hours with 10 hr days on Saturday and Sunday with remaining hours split over 3 days Monday to Friday.

An onsite portacom has been provided for use by the Transfer Station Concierge.

4.3.4.2 Waste Disposal, Loadout Area and Plant

A new at-grade loadout facility and main landfill roundabout intersection has been constructed (2022) to facilitate controlled access to the main landfill for phases 2 and 3 and safe transfer of waste from the transfer station to landfill.

It is expected that the waste will be pushed using suitable plant (i.e. front end loader or similar) from the domestic transfer pit to the loadout area. The loadout facility is at grade and the Contractor shall provide suitable plant to load the transfer truck at grade. It is expected that the loadout plant shall have rubber tracks/tyres to prevent damage to the surfacing of the newly installed structural asphalt. This loadout facility separates heavy plant from members of the public.

The Contractor shall provide, operate and maintain all plant for the transfer station operation. All plant should be in good condition, fit for purpose and meet the requirements of this specification.

4.3.5 Hazardous Waste Area

There is an existing hazardous waste disposal shed with appropriate signage, three lockable bays and intermediate bulk containers (IBCs) for receipt of hazardous waste in the transfer station for use by the Contractor. The following hazardous wastes shall be accepted at the transfer station in domestic quantities (<20KG) only:

Table 4.1: Hazardous waste types accepted at the transfer station

Bay Number	Hazardous Waste Type	Accepted waste
Bay 1	Waste oil	• Engine oil • 2-stroke oil • Hydraulic oil • Lubricating oil
Bay 2	Corrosive acids	• Rust remover • pH Decrease (pools) • De-scaler • Spirits of salts • Citric acid
	Flammable paints and fuels	• Oil/solvent based paints • Resins

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Bay Number	Hazardous Waste Type	Accepted waste
		• Thinners • Solvents • Kerosene • Turpentine • Waste fuels (petrol/diesel)
Bay3	Water based paints and pesticides	• Water based paints • Acrylic Paints • Water paint washings • Water based adhesive/glue • Weed killer • Fertilisers • Garden chemicals
	Corrosive alkalis and cleaners	• Drain cleaner • Bleach liquid • 30 seconds outdoor cleaners • Mould remover • Paint stripper

4.3.6 Green Waste

The transfer station includes an unsealed, metalled drop off and storage area for domestic quantities of greenwaste. The Contractor shall maintain this area including all signage, traffic management and surfacing. The receiving surface shall be well compacted, tight and well graded material to avoid ponding of water and to direct stormwater to controlled drainage systems. This will require that the surface is replenished with suitable material and regraded/recompacted from time to time as necessary.

Greenwaste is not permitted to be disposed of to landfill or used as alternative daily cover and shall therefore be managed using a combination of the following methods:

- Monthly mulching, weighing and removal from site for composting. The Contractor shall ensure that all weights of greenwaste removed from site are provided with the Contractor's monthly claim.
- Occasional mulching for use for protection of intermediate or final cap, refer Section 4.7.

The estimated quantum of greenwaste is 3000 tonnes per annum.

The Contractor shall keep the greenwaste stockpile small in size and at no time shall the height of the greenwaste stockpile exceed 3m.

4.3.7 Recovered Resources and/or Recycling

The Council wishes to encourage the recycling and reuse of waste materials by means of controlled recycling operations at the landfill. Recycling operations involve the deposition of incoming recyclable materials at the transfer station.

In addition to the hazardous waste facility, the existing recycling area has receptacles for:

- Cardboard;

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- Metals;
- Clothing;
- An area is also available for the disposal of whiteware, particularly fridges and freezers and gas cylinders.

The Contractor shall be responsible for the following:

- Maintaining access to the recycling area to a high standard.
- Ensuring receptacles are clearly marked.
- Ensuring receptacles are emptied on a regular basis.
- De-gas all whiteware and gas cylinder prior to removal from site (the Contractor may subcontract this work).
- Ensuring that no more than 15 units of whiteware are stockpiled on site prior to removal.
- Ensuring the waste oil recycling tank is contained within a bund to contain any spillages and that the bund is emptied of any spillages.

The Contractor shall detail in the tender how it is proposed to transfer recyclables off-site including details of any arrangements entered into with subcontractors.

The Engineer reserves the right to cancel any agreement the Contractor has entered into, after giving due notice of the cancellation.

The Principal may enter into separate agreements with other persons, firms or organisations for the operation of recycling facilities within the landfill site and will notify the Contractor in writing of any such agreement. Any such person, firm or organisation will be regarded as a Separate Contractor in terms of Section 5.5 of the General Conditions of Contract.

For the purposes of this contract, the Contractor shall take possession of the recyclables when they are deposited at the landfill.

4.4 Placing of Waste

4.4.1 General

Refer also Section 4.5 in the LMP (2022 version).

Over the contract term general waste shall be placed in the following locations:

- Stage 2 Phase 2
- Stage 2 Phase 3

Refer to Section 1.5.1 of the Specification for details of the landfill development, an indicative filling programme and details of the phase 3 access. During the initial filling and placement of a fluff layer in the new phase 3 cell, it is anticipated that the Contractor shall maintain tip faces in both Phase 2 and 3 until placement of the phase 3 fluff layer is complete. The Contractor is responsible for preparation and maintenance of all tipping areas.

The Contractor shall prepare a detailed methodology for the operation of the landfill tipping areas, which shall include a programme and methodology for both the Phase 2 and Phase 3 operations. This plan shall be submitted as part of the Contractors Landfill Operator Management Plans required under Section 5.1 of this Specification.

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4.4.2 Phase 3 Filling Operation

A 30% design for the phase 3 access has been developed and is included in the Contract Drawings. Refer to the following drawings for details:

- 82948.1000-030 30% Phase 3 Access Design – General Arrangement Plan
- 82948.1000-031 30% Phase 3 Access Design – Stormwater Plan
- 82948.1000-032 30% Phase 3 Access Design – Longsection and Typical Cross Sections

The methodology for the phase 3 access road, load out of waste from the commercial phase 3 tipping area and haulage to phase 3 will be developed in conjunction between the Engineer, the Contractor and the Principal. The 30% design will be developed on this basis to allow for any innovation presented by the Contractor. However, it is envisaged that this operation will generally comprise the following:

a) A new access road will be formed from the end of the existing 12m wide access road that runs across the front face of stage 2 phase 2. The new road will connect the existing access to a new phase 3 tipping pad at the base of phase 2 above the phase 3 cell as shown on drawing 82948.1000-030.
b) The new access road will vary in width between 8.5 in cutting and 10.5 m in fill, including for safety bunds and stormwater drains.
c) The longitudinal grade of the phase 3 access will be 12% where dual lane and 12.5% where single lane near the toe of the valley.
d) A runout safety bay can be provided in the gully at Ch 220 m.
e) The phase 3 tipping pad (minimum 50x50 m) will be constructed above the phase 3 cell from which waste can be pushed into the phase 3 cell. The tipping pad will need to be constructed with the phase 3 enabling works such that the initial lining works to connect to the phase 2 liner is completed first (by others) prior to construction of the phase 3 tipping pad.
f) Given the steep grade of the phase 3 access, for the initial filling operation of the phase 3 cell, commercial vehicles shall not be permitted to traverse the phase 3 access road and so will unload at the designated phase 3 commercial transfer pad in stage 2 phase 2 as shown on drawing 82948.1000-030, located near to the main landfill commercial access.
g) The project team can later assess the level at which waste needs to be placed in phase 3 cell until such time as the phase 3 access road can be safely traversed by commercial vehicles. An initial assessment is that this will be at about RL 110 m or bench 4 of phase 3. The concept design allows for dual lane to RL 110 m for this purpose.
h) The commercial phase 3 transfer pad is proposed to be located next to the phase 3 access road and will be in the order of 50 x 50 m (area can be extended).
i) It is anticipated that the Contractor will provide articulated dump trucks or similar plant to transfer waste from the phase 3 transfer pad to the phase 3 tipping pad above the phase 3 cell.
j) As filling off phase 3 advances up the valley, it is envisaged that the contractor will chase out the tip pad and access road, using any cleanfill for roading, daily cover or other use agreed with the Engineer.
k) As filling of phase 3 progresses and waste is filled higher up the valley, it may become possible to send commercial vehicles to the active phase 3 tip pad and to cease double handling of material.

The Contractor is not required to price construction of the phase 3 access road as part of the Contractors Tender submission. The phase 3 access design will be developed in conjunction with the Contractor and its construction will be a Variation to the Contract. The Principal reserves the right to engage other Separate Contractors to construct the phase 3 access.

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The Contractor shall however price for the phase 3 operation as set out in this Specification, the Conditions of Contract and Schedule of Prices.

4.4.3 Fluff Layer

The initial placement of waste against any lining system shall be as described in Section 4.5.2 of the LMP. The first layer of waste placed against the lining system (i.e. the fluff layer) shall not contain any materials that may result in damage to the lining system. This material should also not contain silty or clayey material that may clog the leachate collection layer.

4.5 Waste Compaction

Compaction of all waste shall be carried out using specialised compaction equipment suitable for the purpose. Plant for compaction of waste shall be a compactor designed specifically for the compaction of waste with a minimum operating weight of 35 tonnes. To ensure that good compaction is achieved, the compactor shall have the following capabilities:

- On board pass mapping (or similar) to allow the operator to see in real-time which areas of the working face have been compacted and track number of passes.
- On board GPS to allow the operator to manage the filling operation and work within geometric design models and slope angles.

The waste shall be spread uniformly in layers of not more than 600 mm thickness. Compaction equipment shall be trafficked in an orderly and systematic manner to ensure that the entire surface of any layer is properly compacted and uniform compaction effort has been applied.

The Contractor shall ensure that a void utilisation ratio of at least 1t/m3 is achieved. The void space utilisation will be calculated as the tonnage of waste delivered to the Landfill, as measured over the weighbridge, divided by the Landfill volume used. Refer to Appendix A for details of historic void space utilisation rate.

The air void utilisation will be measured quarterly by the Principal as per Section 1.11 of this Specification. Details of the air void utilisation survey and calculation will be shared with the Contractor.

4.6 Cover Material

Generally the bulk of this cover material will need to be won from borrow areas on the hillsides surrounding the landfill. Incoming waste will include some suitable cover material and this material shall be identified and stockpiled for use.

4.6.1 Provision of Cover Material

The Contractor shall provide materials for daily and intermediate cover. Cover material for this purpose may be sourced from the onsite borrow areas in the eastern and western ridges off the valley within the landfill designation.

The Council is not prepared to discount disposal fees for particular wastes (e.g. cleanfill, sawdust) to encourage their disposal at the Landfill in order that they may be used for cover. However, the Contractor may, with Council approval, offer discounts to specific waste types for use as cover as long as the cost of such discounts is borne by the Contractor.

Invoices for disposal of waste at the Landfill issued by the Contractor acting as agents on behalf of the Council, shall be for the full charge for the waste disposed of in accordance with the Schedule of Charges current at that time such that monies transferred to the Council for disposal of the waste at the Landfill are those calculated at the full disposal charge rate, not the discounted rate. Any

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discount payments to customers delivering waste to the Landfill shall be made under separate arrangements made directly between the Contractor and the customer.

4.6.2 Daily Cover

Refer Section 4.6 in the LMP (2022 version).

Daily cover material shall comply with a Type 1 material type as defined in the Bulk Earthworks Specification.

4.6.3 Alternative Daily Cover

The Council may consider use of an alternative daily cover system. Any alternative daily cover system must be approved by the Engineer and satisfy the Consent Conditions. Any alternative daily cover system adopted shall be introduced into the Contract Works by way of a Variation.

If an alternative daily cover system is introduced into this Contract the Contractor shall (unless instructed otherwise in the Variation order):

- Provide all Plant and Materials required to apply an alternative daily cover.
- The daily cover shall include an odour suppressant.
- Apply the daily cover at the end of every day, in accordance with the manufacturer's instructions, to all exposed waste unless weather conditions make this non-viable or the weather conditions are such that the alternative daily cover would not achieve the objective of a daily cover material as set out in the LMP (e.g. high winds and/or heavy rain), in which case a soil or other suitable cover shall be applied.

4.6.4 Borrow Areas

Borrow areas shall be restricted to those approved by the Engineer. Borrow area operations shall be carried out in accordance with sound quarrying practice, relevant legislative regulations and the instructions of the Engineer. Excavations shall be carried out so as to ensure the stability of all cut batters and in particular the existing upper stormwater control benches. The Contractor will be responsible for any repairs, alterations or extensions to stormwater benches resulting from the cover extraction operations.

4.6.5 Intermediate Capping

The material used for intermediate cover shall be a site won Type 1 material as defined in the Bulk Earthworks Specification. The intermediate capping shall be placed in layers not exceeding 0.3 m uncompacted thickness, each compacted by track rolling of a bulldozer to create a firm and reasonably smooth surface free of depressions where water may pond. The finished compacted thickness of the earth fill shall be 0.5 m.

4.6.6 Final Capping

Refer Section 3.7 in the LMP (2022 Version) and Drawing 82948.1000-42.

The front face of the landfill surface (Phase 3, 4 and 5) shall receive a final cap as areas reach their final profile levels. The compacted thickness of the final capping shall be 2 m as described in the LMP, which will include a 1200 mm thick low permeability Type 1B low permeability material. The final cap shall be constructed in accordance with the Bulk Earthworks Specification.

The Contractor shall submit to the Engineer a methodology on how the final cap will be constructed for the Engineers approval.

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The Principal reserves right to employ a Separate Contractor to undertake final capping.

4.7 Stabilisation of Capping

The Contractor shall stabilise the capping by using one or a combination of the following:

- Grassing;
- Mulch;
- Hay/straw;
- Other suitable materials identified by the Contractor.

4.7.1 Grassing and Mulching

The Contractor shall propose a suitable grass seed mix and sowing rate from a reputable seed provider and provide this to the Engineer for approval prior to placement. The grass seed mix and sowing rate shall then not be changed without prior approval. The proposed grass seed mix shall consider the following performance criteria;

- Provide permanent grass cover;
- Be drought tolerant; and
- Be tolerant of heavy clay, low fertility soils.

For the purposes of clarity it is acceptable that the grass seed is sown by hand provided the Contractor can demonstrate good coverage of grass seed and fertiliser is applied. Hydroseeding is also acceptable. If hydroseeding is used, green dye is permitted to aid in the application of the product, however the Contractor must take care not to spill any dye into the stormwater system. Any dye spill and resulting costs to rectify shall be borne by the Contractor.

4.7.1.1 Mulch

The mulch used in the Hydro-seeder shall be wood fibre or paper based.

The mulch shall be applied at a minimum rate of 2kg/ 10 m2. The mulch shall contain sufficient seed, fertiliser and glue to enable the seed to germinate and grow on the surfaces to which it is applied.

Under direction of the Engineer, it is acceptable to mulch greenwaste from the transfer station for use as a cap stabiliser and/or growing medium.

4.8 Survey by the Contractor

Refer also to Section 1.11 for details of survey to be completed by the Principal.

The Contractor shall be responsible for setting out the Contract Works from the ruling survey benchmarks, refer Section 1.11. The Contractor will be provided with setting-out information including the waste fill levels to be achieved.

The survey shall be carried out by or under the control of a registered surveyor using accepted techniques such as EDM, SDR map, or GPS. The survey work should preferably be undertaken during a period of low activity at the tipping area but in no case shall the time taken for the survey to be completed exceed 2 hours.

4.9 Special Waste

Refer to Section 4.5.3 and 4.5.4 of the LMP (2022 version).

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Non hazardous special wastes are accepted for disposal at Silverstream Landfill. These wastes, because of their nature, are not suitable for direct disposal in the tipping area. This may be for reasons of security, health risk, nuisance, or others.

The Contractor is to provide on request, sufficient and suitable trenches with all-weather access for direct disposal of these special wastes by the customer. The location of the trenches shall be agreed with the Engineer.

Most wastes in this category will require immediate covering by the Contractor, sometimes under direct supervision by the landfill supervisor, or customer, or both.

Disposal will be arranged in advance by the generator of the waste.

The following wastes, presently disposed of at Silverstream Landfill, shall be considered as special wastes:

- Asbestos (in accordance with the asbestos management plan).
- Milliscreenings (mixed with general waste in active tip face).
- Contaminated soil (mixed with general waste in active tip face).
- Animal Carcasses and fish wastes and offal (mixed with general waste in active tip face or small trenches).
- Sewage treatment screenings (mixed with general waste in active tip face).
- Treated and untreated sewage sludges, refer 4.9.1.
- Other sludges (mixed with general waste in active tip face).
- Confidential Documentation (burial in active tip face).
- Defective Consumer products in bulk (mixed with general waste in active tip face).

This is not an exhaustive list and may be added to from time to time. It shall be the Engineer's decision on what constitutes a special waste.

4.9.1 Sludge Disposal

Liquid waste shall not be accepted at the Silverstream Landfill.

Treated liquid wastes or sludges which, when tested in accordance with the procedures outlined in Appendix C, in the Waste Disposal Guide at Hutt City Council Landfills, April 2011. Sludge should have no free water present, greater than 20% solid content and a slump of less than 200 mm will be accepted. The Hutt City Council reserves the right to vary the acceptance criteria from time to time.

Sludges are generally mixed with general waste in active tip face at a ratio not exceeding 1 part sludge to 8 parts waste. In situations where this ratio can't be achieved due to high sludge quantities, the sludge is generally disposed off in trenches in stage 1, to be confirmed by the Engineer.

4.9.2 Hazardous Wastes

The conditions on which hazardous wastes shall be accepted and disposed of in the landfill are described below and in the document 'Waste Disposal Guide at Hutt City Council Landfills', refer Appendix C.

Hazardous wastes are those wastes which because of their nature, pose an immediate or future threat to the well being of man or the environment. The handling of hazardous wastes requires caution on the part of the Contractor. The Contractor shall ensure his staff is familiar with the necessary safety procedures involved.

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The disposal of all hazardous waste shall be subject to authorisation by a Council Officer or a Consultant, appointed by the Engineer who will specify the method of disposal for each particular waste on a Hazardous Waste Manifest.

Hazardous wastes may require special handling, usually by direct disposal into a specially prepared trench with immediate burial. The Contractor is to make the necessary arrangements for the handling and disposal of this waste strictly in accordance with the instructions on the Hazardous Waste Manifest. No hazardous waste is to be accepted unless accompanied by the required properly completed documentation. All hazardous waste disposal is to be carried out by the Contractor or under the supervision of the Contractor.

Hazardous Wastes are to be accepted only after prior notification. The Contractor is to record on a Hazardous Waste Disposal Record and a suitable site plan supplied by Council, the location, level, type and manifest number of each hazardous waste disposal.

Any waste in a sealed drum is to be treated as hazardous waste and requires a Hazardous Waste Manifest.

The minimum safety equipment is overalls, boots, gloves, safety glasses, a safety mask and a fire extinguisher.

Incorrect disposal of a notified hazardous waste may require the Contractor to recover such wastes, or carry out such works as required to ensure their correct disposal at the Contractor's own cost.

4.10 Scavenging

Scavenging of waste in both the landfill or drop off facility is prohibited and the Contractor shall be considered Council's agent in this respect. All persons observed scavenging shall be asked to desist and to leave the site. For dealing with difficult offenders, the Police shall be called, to remove unco-operative persons.

The Contractor is required to notify the Engineer if any scavenging occurs and provide details of persistent offenders. Where prosecutions under the Bylaws are instigated and the Contractor called as a witness, it shall be at his own expense.

Scavenging by the Contractor's Staff presents a poor image to members of the public and is unacceptable.

4.11 Seagull and Pest Control

The Contractor shall be responsible for the minimising of seagull numbers and other vermin in the landfill area by means of sound and effective landfill practices. This shall include but not be limited to air canons to deter seagulls and traps for feral cats, possums and other pest. Such measures shall be included in the Contractor's costs.

4.12 Washdown Facilities

The Contractor shall have on site suitable wash-down equipment to clean plant and vehicles as required. Cleaning of plant and vehicles shall not occur within 5 m of a watercourse or stormwater drain.

4.13 Litter Control

The Contractor shall be responsible for the control of all litter from the landfill area. This includes all roads, stormwater drains, water tables, sumps, the transfer station and the recycling area.

Where litter screens are provided these are to be maintained by the Contractor.

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The Contractor shall move existing litter screens or construct new litter screens in locations as are necessary to ensure that in the prevailing wind conditions litter is retained within the confines of the working area of the landfill. The Contractor shall ensure litter is collected from any screens on a weekly basis.

Portable litter nets not less than 4m high (or similar) are acceptable, the location of which shall be agreed with the Engineer.

In particular, the Contractor shall ensure that litter is cleared from the following areas of the site:

- The sealed main access road and verges within 24 hours of discovery or notification;
- The administration building and car park area and within 5 metres of all site buildings;
- Public facing areas such as the transfer station, recycling, hazardous waste and greenwaste areas within 24 hours of discovery or notification;
- All permanent culvert structures, sumps, water tables and drains. All drains shall also be inspected for litter prior to and following heavy rainfall to ensure there are no blockages to stormwater systems resulting from litter;
- The landfill tipping area;
- All accessible areas of the landfill;
- Outside the entrance gates and along Reynolds Bach Drive within 6 hours of discovery or notification.

4.14 Dust Control

The Contractor shall be responsible for the control of all dust from the landfill areas and access roads and shall comply with all consent conditions.

The Contractor shall organise his operation to minimise the incidence of dust on the site and undertake appropriate action and provide adequate plant to control or eliminate dust from the following sources:

- Unvegetated areas of the landfill;
- Excessive speed of vehicles on the secondary access roads;
- Over-dry surface of the unsealed secondary access roads;
- Tracked dust/mud deposited on the main access road.

The ESCP prepared by the contractor will identify the measures to be undertaken by the Contractor to avoid and manage dust.

4.15 Odour Control

The Contractor shall be responsible for the minimising of all odours from deposited waste and the landfill area.

The Contractor shall adopt sound landfill operating and management practices to ensure odours from the landfill are minimised which include:

- Arranging for generators of potentially odorous wastes to apply odour suppressing measures prior to delivery and to deliver early in the day;
- Prompt covering of waste;
- Minimising water ingress on the tipping area;
- Odour suppression units;
- Other means suggested by the Contractor.

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4.16 Tracking of Mud onto Main and Secondary Access Roads

The Contractor shall ensure that no mud is tracked from the landfill onto the main and secondary access roads. The Contractor shall undertake measures to prevent this from occurring which may include but are not limited to:

- Metalling of landfill access roads;
- Rumble strips;
- Wheel wash.

4.17 Noise Control

The Contractor shall be responsible for the minimising of noise emissions from the landfill area. The Contractor shall ensure compliance with NZS 6802: 1991 “Assessment of Noise in the Environment” and NZS 6801: 1991 “Methods of Measuring Noise”.

The Contractor shall use appropriate and well-maintained machinery to minimise noise emissions from the landfill operation.

4.18 Fire Prevention

The Contractor shall take all reasonable precautions against the outbreak of fire. The Contractor shall observe and comply with all procedures outlined in Section 1.27 of this specification, and directions of the Engineer relating to the prevention, outbreak, spread and control of fire. The Contractor shall also keep maintained in working order all fire protection and fire fighting equipment.

The Contractor shall be responsible for all costs in extinguishing any fire in the waste.

4.19 Landfill Gas System and Gas Discharge

The Contractor shall observe and comply with all procedures outlined in Section 1.27 of this specification, and directions of the Engineer relating to the prevention and control of gas discharges in the landfill.

4.20 Existing Gas Wells and Gas Field and Power Station Operator

The Contractor shall ensure that activities in the vicinity of gas wells and associated piping are undertaken with care to avoid any damage.

No heavy earthworks or compaction equipment shall pass within 2 metres of the existing gas wells. The Contractor shall demarcate and protect existing gas wells using cones, barriers or similar visual and physical aids. The Contractor shall locate and protect all gas lines. Any damage to gas wells or the gas collection system resulting from the Contractor’s operation will be borne by the Contractor.

The gas wells and associated piping are excluded from the Contractor’s responsibilities, however, the Contractor will be responsible for all damage arising to these items from misuse or negligence by the Contractor and they shall be repaired by the Contractor to the satisfaction of the Engineer at the Contractor’s expense.

The Contractor shall keep the gas field and power station operator fully informed of the weekly landfill operational plans so that the necessary planning, installation of suction pipelines and the extension of gas well pipes can be carried out at the appropriate times.

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4.21 Maintenance

4.21.1 Borrow Areas

The Contractor shall maintain on site borrow areas including keeping stormwater channels and benches free of debris, clearing slips (<10 m3), erosion and sediment controls, constructing and maintaining haul roads for winning cover material and generally ensuring cut batters are stable and comply with the relevant legislative Acts and Regulations for quarrying.

4.21.2 Road Network Maintenance

Access roads and tracks shall be maintained, modified and signposted and traffic management undertaken in accordance with the requirements of the Landfill Resource Consents, the LMP, these Specifications and the Contractor's Operational Plans. Access roads and tracks condition and traffic management practice shall be such that the safe and efficient movement of traffic around the site is promoted and maintained.

The roading network is outlined in Section 2.2 of this Specification.

4.21.3 Main Access Road

The Contractor shall be responsible for the maintenance of the main access road and surrounds as follows:

- Minor maintenance of the existing road seal, including vehicle damage, cracking, surface rutting and potholes. Potholes and failures which allow moisture to enter the granular layers shall be repaired. The repair methodology shall be agreed with the Engineer.
- Maintenance of the existing roadmarking, including wear from vehicle traffic and reinstatement following repairs.
- Maintenance and working order of the kerb and channels, dish channels, and open channels forming the road stormwater system. This shall include regular cleaning out of stormwater sumps and ensure grates are clear from debris. The Contractor is not responsible for replacement of kerb and channel which has failed due to settlement, unless caused by the Contractor's actions or lack of maintenance.
- Clean up and removal of slips which encroach onto the road carriageway or berms. Slips which encroach onto the carriageway shall be signed and coned off immediately and shall be cleared within 12 hours from discovery or notification.
- Any temporary repairs or diversions which are required to repair the existing road carriageway or berm provided they do not cause damage elsewhere.
- Maintenance of the roadside berm and batters to a height of 4 metres above road level. At no time is grass or vegetation, excluding trees and shrubs to exceed 150 mm in height.

4.21.4 Secondary Access Roads

The Contractor shall be responsible for the maintenance of the secondary access roads as follows:

- Maintenance to a standard which provides good access for the public visiting the site. The Contractor shall maintain the secondary access roads to a standard which will allow all year access for commercial and public vehicles and minimise the risk of tyre puncture or other vehicle damage.
- Prevention of any ponding water on the carriageway. Any depressions shall be dressed or filled within 24 hours of occurrence.
- Regular sweeping of the sealed surfaces to remove any build-up of mud.

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- Maintenance in working order of dish channels and open channels forming the road stormwater system, ensuring stormwater is kept away from the carriageway.
- Clean up and removal of slips which encroach onto the road carriageway or berms. Slips which encroach onto the carriageway shall be signed and coned off immediately and shall be cleared within 12 hours from discovery or notification.
- Any temporary repairs or diversions which are required to repair the existing road carriageway or berm provided they do not cause damage elsewhere.
- At no time shall vehicles be required to drive over roughly spread uncompacted hardfill or waste.

4.21.5 All Weather Access to Tipping Area

The Contractor shall be responsible for the provision and maintenance of the all weather access to the tipping area as follows:

- Maintenance to a standard which provides good access for the commercial vehicles visiting the site. The Contractor shall maintain access to a standard which will allow all year access for commercial vehicles and minimise the risk of tyre puncture or other vehicle damage.
- Shaping of the access road to prevent any ponding water on the road and to direct stormwater runoff to erosion and sediment controls. Any depressions shall be dressed or filled within 24 hours of occurrence.
- Regular grading to remove any build-up of mud, especially following wet weather, and redress with site won rock from borrow as required. If the Contractor considers it necessary to import a running material this must be agreed with the Engineer.
- The Contractor shall ensure that at no time are vehicles required to travel over uncovered waste to gain access to the landfill tipping area, and at no time is there to be waste protruding through access tracks.
- When constructing or maintaining access tracks, the area shall be drummed or coned off and an alternative route provided for vehicles. This may be a single lane with adequate traffic control if necessary.
- The contractor must ensure this road is well delineated via cones or other means to limit movement of commercial vehicles around the active landfill
- The Contractor shall undertake reasonable measures to ensure no mud is tracked from the landfill onto the secondary or main access roads and any mud tracked onto and sealed road shall be removed.

4.21.6 Miscellaneous Access Roads and Haul Roads

The Contractor shall maintain in good condition the miscellaneous access roads and haul roads within the site, including the access road to the silt ponds and oil separator/grease trap. The maintenance of these roads shall be to a standard that allows all weather access for service vehicles. Appropriate signs shall be erected where necessary to warn the public to keep out of restricted areas and to be aware of service vehicles or heavy machinery which may use these roads from time to time.

4.21.7 Stormwater Drains General

The Contractor shall ensure that all rainfall on the landfill area that is not contaminated by waste (i.e clean stormwater), is directed to on site erosion and sediment controls, stormwater drains, culverts and watercourses. All rainfall on the active tip face that comes into contact with waste shall be deemed contaminated and directed to landfill.

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The Contractor shall shape the landfill working areas to minimise contamination of stormwater and the volume off stormwater entering the waste mass contributing to leachate. The Contractor shall shape the landfill surface to avoid ponding water.

In addition to erosion and sediment controls on the active landfill the Contractor shall ensure that all controlled stormwater on the site is directed through the existing silt retention pond before being discharged to a natural watercourse.

4.21.8 Stage 1 Stormwater Drains

The Contractor shall maintain all Stage 1 stormwater drains at least bi-monthly (and the concrete perimeter drain on a weekly basis) and prior to and following significant storm events. This shall include removal of litter, obstructions and slip material from all open drains, stormwater cut off drains, inlet/outlet structures, culverts, open channels, layflats, stormwater manholes and flumes.

Blockages and slips shall be cleared within one working day from the time of discovery or notification.

The Contractor shall take care not to damage the existing stage 1 perimeter drain during maintenance. Any damage caused to stormwater infrastructure during maintenance activities shall be made good at the Contractor's expense.

4.21.9 Stage 2 Stormwater Drains

The Contractor shall maintain all stage 2 stormwater drains at least monthly and prior to and following significant storm events. This shall include removal of litter, obstructions, vegetation and slip material from all open drains, stormwater cut off drains, inlet/outlet structures, culverts, open channels, layflats, stormwater manholes and flumes.

Maintenance of stormwater systems shall also include stormwater channels at the base of stage 2 that convey stormwater to Tip Stream. These channels accommodate high flow and should be regularly inspected as part of the Contractor's inspection (Section 5.3). The Contractor shall take care not to damage the existing drains during maintenance. Any damage caused to stormwater infrastructure during maintenance activities shall be made good at the Contractors expense.

4.21.10 Piped Stormwater Systems

The Contractor is responsible for the maintenance of all piped stormwater systems on the landfill and access roads, including the clearing of all blockages, the clearing of sumps and the cleaning of catchpits, within the Silverstream Landfill Site.

The Contractor is not responsible for the repair of failed stormwater piping or structures, unless this is due to the Contractor's negligence or neglect.

The Contractor shall clean all sumps, catchpits, headwalls etc so as to prevent blockage or entry of debris into stormwater lines. These structures shall be inspected as part of the Contractors regular inspections (Section 5.3), prior to and following significant storm events.

There is an energy dissipation unit at the base of the eastern piped let-down near the base of the valley and upstream of the main retention pond. The Contractor shall allow for cleanout of the energy dissipator twice per annum.

4.21.11 Stormwater Retention Pond

Refer also section 2.3.

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The retention pond is located at the base of the valley beyond the long-term landfill extents. The Contractor shall be responsible for maintaining the retention pond and surrounds, which shall include:

- Keeping the pond inlet pipe and headwalls clear of debris and accumulation of silt and debris
- Upkeep and position of the silt curtain.
- Inspect slopes on both sides of the valley along the length of the pond for potential instability and slips and reinstate as required.
- Inspect the condition and stability of pond banks, including checking for any undermining, slips, and reinstate as required.
- Remove any dead or unstable shrubs or trees from the reservoir shoreline.
- Manage and/or remove aquatic weed growth in the reservoir.
- Control of wilding pines around the pond (within 20 m).

The pond requires removal of silt approximately every 5 years to maintain pond performance. The Engineer will advise when the pond needs to be cleaned out and this operation will be considered as a Variation to the Contract. Silt removal works, if required, shall generally include:

- Pumping the pond down to trade waste or Tip Stream (depending on turbidity and Trade Waste discharge conditions).
- Utilise two existing access ramps to gain access to the main pond bay.
- Using excavators, remove silt material and cart to landfill by truck using sealed tail gates.
- Protection and relocation of eels, known to inhabit the pond under direction of the Engineer.

The Contractor is not responsible for any structural repairs to the retention dam and spillway unless damaged by the Contractor's own activities.

4.21.12 Silverstream Dam, Pipework & Decant

Routine maintenance work not requiring engineering evaluation, e.g., control of growth on or near the dam, road maintenance etc., shall be undertaken by the Contractor. Routine dam maintenance that shall be completed by the Contractor shall include:

4.21.12.1 Dam Embankment

The dam embankment should be maintained to prevent damage to the integrity of the embankment and to provide a clear view so that the condition of the embankment can be assessed.

In this section need reference dam documentation. This will be provided when finalised.

With the exception of the dam decant and valve (Section 4.21.12.4), the maintenance items described below shall be undertaken on a monthly basis.

<u>Vegetation:</u>

- In terms of dam safety, good practice is for vegetation on earth dams to be limited to short grass. The Contractor shall:
  - Avoid planting or allowing any new deeply rooted, tall plants or trees to grow on the dam crest and slopes or within 10 m of the dam (i.e. wilding pines or other).
  - Monitor the condition of existing trees around the dam to ensure no trees fall onto the dam face that cause voids or reduce freeboard.
  - Sow grass on the dam face and keep it mowed wherever practical. Where not practical, shallow-rooted ground cover plants are preferred over trees and shrubbery.

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- Maintain grassed areas of the dam and adjacent abutments free of overgrowth.

Heavy vehicles and livestock

- Heavy vehicles and livestock are excluded from embankment slopes to avoid damage, especially in wet weather.
- The dam crest should be monitored for any wear or damage and repaired as needed. Care should be taken in any maintenance or repair activities to ensure the level at the 'crest', particularly the top surface of the low permeability fill is not lowered.

Drains and channels

- Surface water should be controlled to avoid ponding on the dam crest and scour on the dam slopes.
- Rip rapped plunge pool at the toe the dam and downstream spill channel should be kept free flowing and clear of debris and weeds. The spill channel downstream of the plunge pool should also be inspected for scour, especially if there is potential for scour to regress to affect the dam fill.

Wave protection on upstream face

- The upstream face of the dam is protected by grasses and 500 mm of less weathered Type 1 fill. The upstream face should be inspected for any wave damage, animal burrows, slumping and repaired under the direction of the Engineer.

Downstream face

- Inspect the downstream face for any animal burrows, seepage damage, slumping, scour and repair under the direction of the Engineer.

4.21.12.2 Plunge Pool and Downstream Channel

Maintenance activities for the plunge pool and downstream channel at the dam should include:

- Inspect the plunge pool and downstream channel for scour and undercutting of stream banks or potential instability / tree falls that could block the channel. If required, reinstate the channel and stream banks to a stable slope under direction of the Engineer.
- Maintain flow path free of any shrubs, trees, fences and obstructions.

4.21.12.3 Bellmouth Spillway and Outlet Pipe

The maintenance activities for the bell mouth spillway and outlet pipe should include:

- Keep the bell mouth inlet and the outlet pipe free of debris and obstructions.
- Repaint the bell mouth structure to protect it from corrosion, if required by the Engineer.
- Repair concrete damage (e.g., cracking, spalling), if required by the Engineer.
- Repair to the outlet pipe joints, if required by the Engineer.

Note – If bullets 2-4 are required by the Engineer, this will be treated as a Variation.

4.21.12.4 Decant Outlet and Valve

The decant outlet and valve should be inspected as part of the Contractors weekly inspections (Section 5.2). Maintenance may include periodic lubrication and replacement of seals on the valve and ensuring the decant buoyancy and function is as per design intent.

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If required, repair the decant outlet, floating intake, and valve under direction of the Engineer to ensure satisfactory performance.

4.21.12.5 Auxiliary Spillway

The maintenance activities for the auxiliary spillway should include:

- Keep the concrete sill and the channel downstream (i.e., the landfill access road) of the concrete sill free of obstructions.
- Maintain the auxiliary spillway channel upstream and downstream of the concrete sill to ensure a gradual fall. The concrete sill should be the highest point along the auxiliary spillway channel to maintain design capacity.

4.21.13 Grassed Areas

Refer Section 4.23 in the LMP (2022 version).

All grassed areas on the landfill shall be mown as required with a suitable mechanical mower. The areas shall include parts of the landfill covered with an intermediate and final cover material for stages 1 and 2 and include the dam faces, access road verges and all areas of the landfill face which have been sown.

Where batters are too steep for a mechanical mower due to the nature of the valley (such as the dam and stage 2 face) the Contractor shall spray weeds and cut grass using commercial weed eaters.

The Contractor shall ensure that all grassed areas are well maintained and do not compromise the capacity of stormwater channels through lack of maintenance.

The grassed area in the vicinity of the kiosks and amenities building requires special attention to ensure a high standard of presentation in keeping with the Council's objective to present a professional image for the landfill. The grass shall be mown at frequent intervals to ensure that the area is always tidy.

At no time is grass or vegetation to exceed 100 mm in height in the vicinity of the kiosk, main access road, amenity buildings and transfer station and 250 mm on the landfill faces.

4.21.14 Leachate

Refer Section 4.11 In the LMP and Drawing 82948.1000-011 Existing Leachate Network and the Standard details drawings.

4.21.14.1 Leachate Gravels

The landfilled waste is drained by a system of perforated leachate pipes within the landfill which are drained by gravity to trade waste via the sewerage system. The main leachate line is piped down the access road at the base of the valley beyond the stage 2 phase 1 toe bund. Leachate passes through a fenced grit separator before flowing by gravity to trade waste and the main Hutt Valley Sewer.

The Contractor is responsible for maintaining the existing leachate and sewer system within the landfill site, to ensure its continuous operation and shall carry out any repairs, or regular maintenance as required.

The Contractor is to minimise the possibility of contamination of the adjoining watercourse by regular inspection and maintenance of this leachate system. Any maintenance work carried out shall be so arranged as to avoid contamination.

The leachate system shall be inspected weekly for blockages or leakage. The Contractor shall clear all blockages in the leachate drains and repair any leaking pipes as instructed by the Engineer.

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The Contractor shall clean the main gully sewer line with specialised high pressure pipe cleaning machinery as instructed by the Engineer.

4.21.14.2 Clean Out Grit Interceptors

Sediment levels in the grit interceptors will be monitored by the Engineer. Where clean outs are required these will be requested of the Contractor via written communication (email or NTC) for action within the following four (4) weeks.

In addition to the above, where the Contractor observes high sediment levels (more than 2/3 full) they shall advise the Engineer for instruction.

Sediment shall be removed via hydrovac or similar approved method, with care taken to ensure that the concrete interceptors are not damaged and remain in good condition. Excavated sediment shall be disposed of to the landfill face for mixing with waste.

4.21.14.3 New Leachate Drains

New leachate drains required will be instructed by the Engineer as a Variation to the Contract. Where leachate drains are required these will be requested of the Contractor via written communication (email or NTC) for action within the following four (4) weeks.

Refer to Section 9 of this Specification and the standard details drawings for details of materials and standard leachate drain details.

The Contractor shall submit the following photographs as part of the monthly claim:

- The excavated trench prior to the placement of leachate gravels;
- The HDPE pipe placed within the trench;
- The reinstated trench surface.

4.21.14.4 Leachate Breakout Repairs

The Contractor is responsible for identifying and responding to leachate breakouts in accordance with the requirements of this Specification and the LMP.

As noted in the LMP, leachate breakouts shall be located and contained as soon as practicable. For the purposes of assessment this shall be no more than 24 hours from when the Contractor becomes aware of the breakout. Containment will typically involve temporary bunds, pits or piped diversions. Reasonable works may be undertaken by the Contractor at their own discretion without input or approval from the Engineer.

Once the leachate breakout has been contained, the Contractor shall review their marked-up copy of the leachate drawing to identify if a leachate breakout has previously occurred at that location;

- Where no leachate breakout has previously occurred, the Contractor shall undertake a standard leachate breakout repair as described below; or
- Where a leachate breakout has previously occurred the Contractor shall notify the Engineer for further instructions.

4.21.14.5 Standard Leachate Breakout Repair

A standard leachate breakout repair is shown on Drawing 82948.1000-042 Standard Details Sheet 3 of 3.

Repairs shall be completed within five (5) working days of the leachate breakout being identified.

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Requirements for each of the repair layers as shown on the Drawing are described in the following Specification sections:

- Capping material – refer Section 8, Bulk Earthworks Specification;
- Leachate gravels – refer Section 9, Trenching, Bedding and Backfilling for Underground Pipes Specification) and
- Geotextile – refer Section 10, Protection Geotextile Specification.

The Contractor shall submit the following photographs as part of the monthly claim:

- The works area prior to works commencing;
- The excavated pit prior to the placement of leachate gravels;
- The completed repair.

4.21.15 Erosion and Sediment Control

The Contractor shall maintain all erosion and sediment control measures on site to meet the requirements of the Resource Consent conditions and the Erosion and Sediment Plan.

All erosion and sediment control measures should be routinely inspected as part of the Contractor's fortnightly routine inspections (Section 5.3) and following heavy rainfall and storm events. Where such inspections identify that the controls require cleaning, the Contractor shall undertake this work within two (2) working days of occurrence.

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5 Landfill Operator Management Plans, Inspections and Reporting

5.1 Landfill Operator Plans

Landfill operator plans shall be completed in draft format to a sufficient standard to be accepted by the Engineer prior to the date of commencement and shall be completed within 3 months of the Date of Commencement.

These plans are:

- Site Specific Safety Plan;
- Traffic Management Plan;
- Quality Plan;
- Environmental Management Plan including an Erosion and Sediment Control Plan; and
- Asbestos Management Plan.

5.1.1 Site Specific Safety Plan

The Contractor shall prepare a Site Specific Safety Plan (SSSP) to comply with the Requirements of Section 1.6 of this Specification and Clause 5.17 of the General Conditions.

5.1.1.1 Traffic Management Plan

The Contractor shall prepare a Traffic Management Plan as part of its SSSP and Clause 5.19 of the General Conditions.

The Traffic Management Plan shall be updated as required during the Contract Works Period. Adequate safeguards to the users of the Landfill in respect of temporary fences, signals, signs and lights shall be provided at all times as required by the Contract Works. Where administrative controls such as traffic signage are deemed necessary, these shall be provided and operated by the Landfill Operations Contractor in keeping with the local authorities' guidelines but erected only with the approval of the Engineer.

The Contractor's Traffic Management Plan shall:

- Comply with the Contract Documents;
- Comply with the Code of Practice for Temporary Traffic Management (CoPTTM);
- Cover all site traffic activities;
- Make special provision for all activities that occupy or cross an area occupied or traversed by either the public or Separate Contractors;
- Comply with normal road safety rules;
- Provide physical separation from the public as far as practical.

5.1.2 Quality Plan

The Contractor shall provide its quality plan (Quality Plan) as required by Clause 5.18 of the General Conditions.

The Quality Plan shall include details of the Contractor's Quality System and demonstrate how the Contractor will meet the requirements of this System with emphasis on:

- Environmental Management.
- Procedures for monitoring of work procedures and methods for compliance with the requirements of the LMP and Landfill Operations Plans,

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- Procedures for monitoring of work procedures and methods for compliance for the maintenance of the landfill for compliance with the requirements of the LMP, Specification and Landfill Operations Plans,
- Procedures for ensuring all Materials comply with the relevant specifications,
- Defined testing methods, standards and frequency of testing where required,
- Procedures for reporting test results to the Engineer,
- Requirements for notification of the Engineer when an inspection is required and requirements for sign off for works as complete,
- Procedures for recording and resolving non-compliance with the Quality Plan,
- Procedures for ensuring all Contractor personnel engaged in the undertaking of work on the Site are qualified, experienced and trained for that work,
- Procedures for ensuring that the Contractor's obligations for reporting of information are met,
- Procedures for ensuring any Subcontractor's performance is monitored and maintained,
- Procedures for gathering and recording as built details and passing information to the Engineer (e.g. progression of waste filling etc),
- Procedures for internal audit of compliance with the Quality Plan and review of the plan.

5.1.2.1 Environmental Management Plan

The Contractor shall include an Environmental Management Plan (EMP) as part of its Quality Plan. The Contractor is required to compile and implement an Erosion and Sediment Control Plan (ESCP) as an Appendix to the EMP. The Contractor shall refer to the Erosion and Sediment Control Framework Document and Clause 1.2.4 of this Specification for guidance when compiling these documents. The framework document is attached as Schedule 29 to the Contract Documents.

The Council regards protection of the environment as an integral part of the Landfill operations and development. The Contractor and its personnel shall be aware of and comply with all relevant environmental laws, regulations and consent conditions pertaining to the carrying out of the Contract Works.

The Contractor shall provide such temporary stormwater contamination control provisions as are required to prevent pollution of stormwater courses or natural water in all areas where the Contractor intends to refuel plant or park plant overnight.

The Contractor shall take steps to ensure that no hydrocarbons are allowed to drain to ground during any operation and that all hydrocarbons are collected in drain trays or collection vessels. Soil bunds shall be constructed around any diesel fuel storage tanks to prevent any potential spillages or leaks from draining to other areas of the Site. Any soils which may have been hydrocarbon contaminated must not be transferred off site or spread in any uncontrolled manner to other areas of the Site. Any contaminated soil excavation materials shall be disposed of in a manner suited to the type and level of contamination (including, but not limited to, double bagging and disposal at a registered contaminated landfill, if appropriate).

The Contractor shall control environmental nuisances in accordance with Section 4.13 of the LMP and the Erosion and Sediment Control Framework document. The Contractor shall operate and maintain the existing deodoriser spray lines at the Landfill.

The EMP must be specific to this Contract and demonstrate how the Contractor will meet the requirements of the Contractor's Quality System with emphasis on:

1 Details of the steps the Contractor shall take to comply with the requirements of the Landfill Resource Consents (refer Appendix A of the LMP), including:

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- Achieving compliance with all specific conditions of the Landfill Resource Consents,
- Achieving compliance with the Erosion and Sediment Control Plan,
- Identification of environmental hazards and their likely impacts,
- Details of the steps the Contractor will take if the effect of operations is likely to create an adverse effect on the environment,
- Procedures relating to the discovery of cultural and archaeological artefacts.

2 Control of runoff from earthworks, channels, berms, flumes, etc. in accordance with relevant Regional Resource Management Plans, the Landfill Resource Consents and the Erosion and Sediment Control Plan including details of:

- Procedures for taking of water,
- Procedures for managing discharges into streams and reticulated storm water systems during the carrying out of the Contract Works.

3 Erosion control systems shall be in accordance with any relevant Regional Resource Management Plans, the Landfill Resource Consents, the latest revision of the Greater Wellington Regional Council 'Erosion and Sediment Control Guide for Land Disturbing Activities in the Wellington Region' and shall be maintained in a fully operational condition throughout the Contract Works Period and shall have in place:

- Procedures for managing surplus earth disposal,
- Procedures for managing stockpiled material,
- Procedures for managing disposal areas,
- Procedures to control sediment and silt runoff into waterways,
- Procedures to prevent erosion and, where required, reinstatement of all eroded areas.

4 The Contractor shall ensure that no hazard, annoyance, nuisance or damage is caused to traffic or property owners or other members of the public near the landfill through the discharge of noise, dust or contaminants, including odours, from the Contract Works and/or the Site and shall have in place:

- Procedures to minimise the generation and reduce the effects of noise and dust, etc,
- Procedures to control drift of chemicals and fertilisers and actions taken if drift occurs,
- Procedures for minimising and managing the discharge of contaminants into air including odours,
- Procedures to prevent fuel and oil spills to the land or water including the actions taken if spill occurs.

5 Liaison with all affected organisations, residents, property owners etc.

5.1.2.2 Asbestos Management Plan

As part of the Contractors Quality Plan, the Contractor shall provide an Asbestos Management Plan. The Contractor and its personnel shall be aware of and comply with current Health and Safety at Work (Asbestos) Regulations and all other relevant laws and regulations pertaining to the carrying out of the Contract Works.

The Asbestos Management Plan shall comply with the requirements of the Health and Safety at Work (Asbestos) Regulations and include but not be limited to:

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- Roles and responsibilities,
- Control limits,
- Asbestos handling, disposal and monitoring procedures,
- Asbestos monitoring register,
- Signage,
- Risk assessment,
- Health monitoring of workers,
- PPE,
- Emergency procedures.

5.2 Carbon Reductions

Council is committed to caring for and protecting the environment and have put in place the Interim Carbon Reduction and Climate Resilience Plan for Hutt City Council 2021-2031. The plan sets out Council's vision to become carbon neutral by 2050 and includes Council's goals to achieve this objective. The broad goals are as follows:

1. Reducing Hutt City Councils corporate emissions to net zero by 2050.
2. Facilitating a reduction in Lower Hutt's greenhouse gas (GHG) emissions to achieve net zero by 2050.
3. Supporting our city to build climate resilience.

The Contractor shall refer to 'Measuring Emissions: A Guide for Organisations', Ministry for the Environment, 2020.

Councils requirement for this contract is that by 2030, the landfill operator will reduce carbon emissions associated with the landfill operation (within their control) by a minimum of 25%, with a desirable reduction target of 50% compared to the 2020/2021 base year.

For purpose of establishing a baseline carbon footprint for the first year of the Contract, the estimate for the landfill operation Scope 1 emissions (Direct emissions from owned or controlled sources) and Scope 2 emissions (Indirect emissions) for the 2020/2021 Financial Year is 651 tonnes. Therefore, the maximum allowable annual operational emissions is 488 tonnes (preferably 326 tonnes) by 2030.

To ensure emissions associated with landfill operations decrease in line with Council's targets, the Contractor shall undertake the following:

- Within six months of contract start, a carbon measurement framework is to be established, in line with accepted reporting standards, and in relation to the emissions associated with the services provided for Hutt City Council.
- By 31 August each year, the Contractor shall report on its emissions. The report shall include all three Scopes and the associated exclusions. The Scopes can include, but is not limited to the following:
  - Scope 1 - Direct emissions from owned or controlled sources:
    - Fuel consumption in relation to plant/machinery
    - Fuel consumption for fleet/km travelled for the fleet
    - Hire vehicles

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  - Scope 2 - Indirect emissions:
    - Electricity consumption
    - Gas consumption
  - Scope 3 - All other indirect emissions that occur in value chain:
    - Travel (flights, taxi, accommodation)
    - Personal vehicle usage
- Development of a Carbon Reduction Plan, with detailed information on the Contractor's intended and planned actions to deliver on carbon reduction objectives, including steps towards meeting councils target of halving emissions by 2030 compared to an agreed reference year. The plan shall be updated on an annual basis to demonstrate how the landfill operation aligns with Councils Carbon Reduction Plan and to demonstrate a reduction in carbon emissions over the life of the contract.

Note, the reporting requirement on the 31 August and development of a Carbon Reduction Plan is linked to the Compliance and Performance contract requirements, refer Section 6.

5.3 Contractor's Inspections of Site

5.3.1 Inspection of the Site

The Landfill Operations Contractor shall inspect the Landfill site weekly to ensure all structures, facilities, infrastructure and services are operating correctly. This will include capped areas (final cap and intermediate cap), surface water drains, surface water settlement ponds, inlets and pipes, leachate ponds and discharge mains, litter controls, any exposed liner, roadways and signs, odour control measures, gas extraction system, weighbridge and fences.

Records of such inspections shall be kept by the Landfill Operations Contractor in an appropriate form. These records and any deficiencies identified shall be rectified and actions taken recorded.

5.4 Monthly and Annual Reporting

5.4.1 Monthly Report

The Contractor shall provide a monthly report to the Engineer with the monthly claim and shall include the following information:

- Provide a record of health and safety matters in the period, including but not limited to, near misses, incidents, lost time injuries, investigation and close out of these reports, identification of any new hazards etc.
- Daily quantities of waste (by type) received at the Landfill for each day of the month and totals for the month.
- Quantities and type of waste and charges by account for each day of the month and totals for the month.
- Quantities of waste that have been directed elsewhere rather than accepted at the Landfill, their sources and if known their disposal sites, and the date of each such event.
- Quantities of materials other than waste imported to the Landfill in the month e.g. leachate drainage stone and material imported by the Contractor for use as daily or intermediate cover.

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- A summary of all maintenance items completed in the month and a schedule of maintenance works to be completed in the following month. This schedule should accommodate any maintenance items identified by the Engineer.
- Water quality monitoring results.
- Details of filling sequence for the subsequent months waste filling to demonstrate how the landfill will be filled to the final fill profile for each slope. Final fill profiles for each slope will be provided by the Engineer.
- Areas to receive intermediate cover and grassing.
- Measures to be implemented to control stormwater runoff and erosion and sediment control measures on and around the tip pad and active landfill working areas.
- Notification of any amendments required to the landfill gas collection system as part of the filling operation.
- Details of the asbestos disposal area. The asbestos disposal area shall be physically marked on Site in accordance with the Asbestos Management Plan and will be surveyed in the approximately quarterly surveys arranged by the Council.
- A list of any Contractor performance deficiencies identified by the Engineer and notified to the Contractor and any actions taken to correct such deficiencies including details of any demerit points issued.
- Reports of site inspections carried out by the Contractor and any actions taken to correct any deficiencies identified.
- A list of 'Notices to Contractor' and 'Notices to Engineer' issued in the month with details of current status.
- A list of any complaints received and the action taken to address them for each day of the month.
- A list of all emergencies arising in connection with the carrying out of the Contract Works and/or the Site with appropriate detail.

A report template is included in Appendix E of these Specifications.

5.4.2 Annual Report

The Contractor shall provide an annual report to the Engineer within one month of each anniversary of the Date of Commencement and shall include the following information:

- A summary of Contract Works carried out including filling areas utilised, engineering works carried out, modifications to site infrastructure/layout e.g. access tracks,
- Quantities of waste for each month (by type) received at the Landfill and totals for the year.
- Quantities and type of waste for each month by account received at the Landfill and totals for the year.
- Quantities of materials other than waste for each month imported to the Landfill and totals for the year.
- A full list of demerit points issued with details of the non-conformances to which they relate and actions taken.
- A full log of complaints received for the year, actions taken and status of the complaint.
- A full list of emergencies for the year with actions taken and any measures instigated to prevent reoccurrence.

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5.5 Stormwater Monitoring

Monitoring of the landfill is required to provide information in assessing the effectiveness of the landfill operation and the effect of upgrading works. Monitoring is also required to ensure compliance with resource consent requirements.

5.5.1 Water Quality

Daily visual water observations (colour, flow, foam, algae, odour) and conductivity measurements shall be taken by the Contractor as described in Section 4.24 of the LMP (2022 version). The results of the monitoring shall be recorded on the conductivity reporting form and provided to the Engineer with the Monthly Report.

If conductivity readings are in excess of 500 uS/cm, then the contingency actions as outlined in Section 1.29.1 of this specification must be followed. In response to a reading in excess of 500 uS/cm, monitoring of temperature, pH, ammonia, and chloride shall be taken from all stormwater sample locations. The results of these tests shall be recorded on the appropriate form as per Appendix D.

In addition to daily conductivity readings the silt ponds must also be checked daily and any litter cleared from the ponds.

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6 Compliance and Performance

6.1 Performance Indicators

The carrying out of the Contract Works and the operation of the Landfill will be subject to quality inspections and audit of all aspects of the Landfill operation by the Engineer and the Principal on a random basis but expected to be on at least one occasion each month.

Refer also Clause 17 of the Specific Conditions of Contract – Other Conditions of Contract.

Inspections will be based upon the following performance indicators each of which are obligations of the Contractor as outlined in the Specification, Landfill Management Plan and the Landfill Operator Management Plans. These documents should be referenced for each performance criteria.

Table 6.1: Performance Indicators

Ref	Performance Indicator	Description
1	General appearance	The Landfill including active and closed areas of the Landfill, access routes and all Landfill facilities shall be kept in a neat and tidy condition such that the Landfill presents a professional appearance to users, visitors and the general public.
2	Health and safety	Compliance with the accepted Contractor's SSSP and the health and safety requirements of the Contract documents is required at all times. A positive and pro-active attitude to health and safety is also expected to be demonstrated.
3	Reporting	Provision of the required reports on time and including all information required by the Specification.
4	Customer & financial management	Customer, account management, collection of fees to Hutt City Councils account and general customer management shall be carried out to professional standard meeting all appropriate legal and best practice standards and providing responsive customer service and resolution of complaints.
5	Transfer Station	The transfer station is well run as specified, clean and tidy including the hazardous waste collection area, recycling facilities, transfer pit and loadout area. The greenwaste stockpile is well maintained and greenwaste is removed from site monthly.
6.1	Odour control	Odours shall be controlled so as to prevent any unacceptable odours on or around the Site. Assessment of this performance indicator shall include assessment of odour control practices being employed by the Contractor whether or not unacceptable odours are occurring.
6.2	Litter control	Litter shall be controlled so as to prevent any unacceptable occurrence of litter on or around the Site and the surrounding area arising from the Contract Works. Assessment of this performance indicator shall include assessment of litter control practices being employed by the Contractor whether or not unacceptable littering is occurring.

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6.3	Birds and vermin control	Bird and vermin (including cats and possums) numbers shall be kept at a level such that they do not impact on neighbours or become visible to users of the Landfill. Assessment of this performance indicator shall include assessment of bird and vermin control practices being employed by the Contractor whether or not unacceptable bird or vermin numbers are occurring.
6.4	Dust	Dust shall be kept at a level (using dust suppression methods) such that it does not impact on neighbours, landfill customers, the gas plant and landfill workers including operational, capital suppliers and their subcontractors. Assessment of this performance indicator shall include assessment of dust control practices being employed by the Contractor whether or not unacceptable dust levels are occurring.
6.5	Compaction of waste	A high standard of waste compaction is required to maximise the use of Landfill void space. A void space utilisation rate of >1.0 tonne of waste per m^3 of void space used has been achieved at the Landfill and this is required to be continued. To compare the compaction performance being achieved on site with the specified rate of >1.0 tonnes/m^3 the void space utilisation rate will be calculated following each approximately quarterly drone survey. The void space utilisation will be calculated as the tonnage of waste delivered to the Landfill, as measured over the weighbridge, divided by the Landfill volume used.
6.6	Special waste	Compliant handling and disposal of special waste such that any health and environmental hazards are adequately controlled and nuisances (odour, dust etc) are kept at a level such that they do not impact on neighbours or the users of the Landfill (refer to requirements above). Assessment of this performance indicator shall include assessment of practices being employed by the Contractor for the disposal of special wastes, whether or not unacceptable health or environmental hazards or nuisances are being created.
6.7	Active tip face management	The tip pad size is not excessive and within the permitted size limits. Daily cover is applied to the active tip pad at the end of each day such that any nuisance (odour, dust, vermin etc) are well managed and do not impact on neighbours, customers or workers of the Landfill. Assessment of this performance indicator shall include assessment of cover practices being employed by the Contractor whether or not unacceptable nuisances are being created.
6.8	Intermediate and final capping	Intermediate / final capping is constructed as specified such that any nuisance (odour, leachate, dust, vermin etc) does not impact on the environment, neighbours, customers or workers of the Landfill. Assessment of this performance indicator shall include assessment of material and construction practices being employed by the Contractor in terms of compliance with specification whether or not unacceptable health or environmental hazards or nuisances are being created.

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6.9	Storm water management and Erosion and Sediment Controls	All stormwater systems are well maintained operational, clear from litter, weeds and obstruction. Erosion and sediment control measures are installed and maintained in line with the principles outlined in the Erosion and Sediment Control Plan, Specification and Operator Management Plans. Assessment of this performance indicator shall include assessment of operation and maintenance practices being employed by the Contractor whether, or not the objectives are being achieved.
6.10	Leachate management	Leachate drains are operational and well maintained. This performance indicator shall include assessment of the effectiveness of measures to exclude leachate and other contaminants from surface water. Assessment of this performance indicator shall include assessment of operation and maintenance practices being employed by the Contractor whether, or not the objectives are being achieved.
6.11	Road maintenance, signage and traffic management	Access roads and tracks including all signage, linemarking and traffic management shall be installed and maintained as specified. Sealed roads shall remain free from silt. Assessment of this performance indicator shall include assessment of road maintenance and traffic management practices being employed by the Contractor whether, or not unacceptable conditions are present.
6.12	Resource consent compliance	Works completed comply with all Resource Consents. Assessment of this performance indicator shall be based on measures taken to comply with resource consents whether or not any breaches of consent occurred in the period.
6.13	General compliance with the requirements of the LMP, Specification and Contractor's Operations Plan	The Contractor shall comply with all of the requirements of the LMP, Specification and the Contractor's Operations Plan. Assessment of this performance indicator shall include assessment of all operation and maintenance practices being employed by the Contractor and achievement of required outcomes not covered by the specific areas of operation set out above.
6.14	Decarbonisation	As per Section 5.2 of the Specification, provision of annual reporting on 31 August each calendar year as per and development of a carbon reduction plan. Demonstration of progress towards meeting the decarbonisation goals set out in section 5.2.

6.2 Assessment of Quality Related Performance and Issue of Demerit Points

If the Contractor's performance in relation to the performance indicators is acceptable the Contractor will be entitled to a Performance Bonus Payment. If significant deficiencies are found in

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any of the performance indicators listed above, demerit points will be determined by the Engineer and issued to the Contractor. Issue of demerit points can result in loss of Performance Bonus Payments and in cases of extreme non-performance, termination of the Contract (refer to Clause 6.3 of these Specifications and Clauses 14.2.1(g) and 17 of the Other Conditions of Contract.

Demerit points will be issued for each performance indicator on the following basis:

- Minor non-conformance: One demerit point
- Moderate non-conformance: Two demerit points
- Serious non-conformance: Three demerit points.

Minor non-conformances: are minor variations from the standard required that:

- Have not had any significant impact on management of the Landfill or financial or operational performance of the Landfill and;
- Have not generated any nuisance but;
- Are causing an adverse effect on the appearance of the Landfill and/or;
- Have the potential to effect operational performance or cause a nuisance or adverse environmental effect if they are allowed to persist;

Examples of minor non-conformances are (but not limited to):

- Deficiencies in the required reports
- Excessive littering on the Landfill site
- Minor deficiencies in the standard of daily or intermediate cover
- Slight deterioration of road surfaces below the standard required.

Moderate non-conformances: are variations from the standard required that:

- Have not generated any off-site nuisance and;
- which do not present an immediate health and safety risk but;
- Result in a significant impact on the management of the Landfill or financial or operational performance of the Landfill and/or;
- Are likely to cause an offsite nuisance if they are not urgently rectified and/or;
- Are likely to present a health and safety risk if not rectified and/or;
- Are likely to cause an adverse environmental effect if they are not rectified.

Examples of moderate non-conformances are (but not limited to):

- Non-conformance with the Contractor's Site-specific safety plan that have no immediate safety risk but which require to be rectified
- Late opening of the landfill
- Activities causing delay to customers entering the landfill
- Financial irregularity such as occasional erroneous or late invoicing
- Late provision/update of the required management plans or reports
- Excessive birds/vermin
- Dust nuisance on site/lack of dust control
- Leachate break out that may lead to surface water contamination,
- Serious deficiencies in the standard of daily or intermediate cover,
- Serious deterioration of road surfaces below the standard required,
- Failure to achieve a void space utilisation rate of >1.0 tonnes/m3
- Partial blockage of a surface water drain (by litter debris or weeds)

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- Failure to desilt erosion and sediment controls,
- Inadequate procedures to deal with special waste such that odours may be released from the Site and cause a nuisance,
- Failure to carry out any routine maintenance that may affect Landfill operation, environmental or nuisance controls and/or health and safety.

Serious non-conformances: are variations from the standard required that:

- Result in serious impact on management of the Landfill or financial or operational performance of the Landfill and/or;
- Have generated a nuisance and/or;
- Present an immediate safety risk and/or;
- Are causing an adverse environmental effect;

Examples of serious non-conformances are (but not limited to):

- Significant non-compliance with the Contractor's site specific health and safety plan or other unsafe situation,
- Serious financial irregularity such as extensive or repeated erroneous or late invoicing;
- Very late opening or failure to open the landfill;
- Failure to provide/update the required management plans or reports;
- Dust blowing off site;
- Leachate break out resulting in contamination of surface water;
- Failure to place daily or intermediate cover;
- Deterioration of road surfaces such that roads are impacting on the ability of vehicles to safely or efficiently access the Landfill;
- Failure to achieve a void space utilisation rate of >0.95 tonne/m3;
- Complete blockage of a surface water drain that has potential to cause damage to the landfill cap or assets;
- Failure of the main settlement pond decant systems;
- Release of odours causing a nuisance beyond the landfill boundary;
- Failure to respond to a call-out relating to landfill activities and any activity or lack of action on the part of the Contractor that has resulted in a validated complaint by a member of the public or user of the Landfill site or a breach of the Landfill's Resource Consents.

The Engineer or Principal will record the results of inspections on a form that will set out the nature of any non-conformances identified. In the case of deficiencies identified by the Engineer or Principal that are the result of recent conditions outside the Contractor's control (e.g. debris fall in a storm that has blocked a drain, excessively odorous waste delivered to site, power supply failure, earthquake, pandemic), the Engineer may exercise his or her discretion to not issue a demerit point(s) but require that the deficiency is rectified as soon as possible. All non-conformances identified whether or not a demerit point(s) has been issued shall be rectified as soon as possible. A further demerit point will not be issued for a Minor non-conformance within a two day period. This effectively gives the Contractor a maximum of 48 hours to rectify any such non-conformance. In the case of a Moderate or Serious non-conformance, particularly when a nuisance is being caused or is likely to be caused or an unsafe condition exists or may develop, the Engineer may require an immediate rectification of the non-conformance and additional demerit points may be issued if such rectification is not carried out.

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6.3 Quality related non-performance

If the Contractor is issued with more than two demerit points in any given month, or more than six demerit points have been issued in total in the six month period ending with the current month, the Contractor will not be entitled to receive the Performance Bonus Payment for that month.

If the Contractor is issued with twenty or more demerit points in any rolling three month period the Contractor shall be deemed to be in breach of this contract. If this occurs the Principal may terminate the contract in accordance with Clause 14.2.1(g) and 17 of the Other Conditions of Contract. If this occurs the Contractor shall not be entitled to compensation from the Principal for early termination.

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7 Broader Outcomes and Innovation

7.1 Broader Outcomes and Innovation

In addition to the requirements of the Contract Documents, Council expects the Contractor to proactively undertake measures to continually improve the level of service relating to landfill operations and Council's broader outcomes. To assist with this, and not to replace the expectation of continual improvement on the part of the Contractor, the Contract includes an Innovation Fund Cap. The intent of this fund is to encourage all contractual parties to think wider than the immediate contract and to consider innovations and improvement measures that will add value to the landfill operation and Council's broader outcomes.

Refer also Clause 22 of the Specific Conditions of Contract – Other Conditions of Contract.

It is intended that this framework will be governed in accordance with Section 22 (Broader Outcomes and Innovation)and either the signatories of this Contract or the senior delegated authorities from each contracted party. For the purpose of this framework, this group shall be referred to as the 'Governance Group', established in accordance with Clause 18 of the Specific Conditions of Contract – Other Conditions of Contract.

The framework for this fund is outlined below:

1. **Innovation Fund:** The Contract includes provision for an Innovation Fund Cap as a Provisional Item in the Schedule of Prices. This sum shall be set and renewed on an annual basis by Council. Access to the fund shall only be granted subject to Council approval of the development of acceptable KRAs and KPIs as determined by the Governance Group (refer below). Council reserves the right to amend the value of this fund or cease it altogether at its absolute discretion.

2. **Key Result Areas (KRAs):** In the month immediately following the contract anniversary date, the Governance Group shall meet to discuss the development of KRAs to be adopted for that particular year. It is expected that KRAs will need to be updated from time to time to respond to any changes in landfill operation or desired Council Outcomes. All KRAs must be approved by Council prior to development of KPIs. The initial KRAs for the first year of the contract have been set in section 7.2.

3. **Key Performance Indicators (KPIs):** The Contractor shall develop KPIs to meet the requirements of the KRAs. Each KPI shall be clear and measurable. The Contractor shall price each KPI, the value of which shall be agreed with the Engineer. The total cost of achieving all the KPIs shall not exceed available funding (unless otherwise approved by Council).

7.2 Key Result Areas

The Key Result Areas shall be reviewed and set by the Governance Group on an annual basis. The initial KRAs for the first year of the Contract have been defined and are outlined below:

1. Carbon reduction

Reducing emissions and the carbon impacts of the delivery of the services, for example (but not limited to) through the use of low carbon fuels.

2. Resource recovery and diversion

Maximising resource recovery in landfill operations to extend the life of the landfill, for example (but not limited to) salvaging metals from the tip pad, recycling and improved recovery at the transfer station.

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3. Health and Safety

Delivering the services in a manner that is safe for staff and service users.

7.3 Key Performance Indicators

The Contractor shall review the KRAs set by the Governance Group and develop KPIs to achieve the KRA outcomes. Each KPI shall:

- Be clear and concise and relevant to the KRA outcome;
- Be measurable;
- Be priced/assigned a monetary value by the Contractor and that value agreed with the Engineer;
- Be accepted by the Principal.

Where the Contractor becomes entitled to payment under clause 22.2(b)(ii) of the Contract, and without otherwise limiting clause 22.2(b)(ii), the following procedure shall apply:

1. The Contractor will notify the Engineer in writing on completion of any particular KPI, which will then be verified by the Engineer. Payment shall be made to the contractor on successful completion of each KPI to the agreed monetary value of that KPI. The Contractor will then be entitled to claim the agreed value of the KPI in the claim following completion and verification of the KPI.
2. Depending on the nature of the KRA and subsequent KPI, part payment of the KPI value may be made to the Contractor on mutual agreement of all parties (for example if there are upfront costs required to achieve the desired outcome) and demonstrable progress towards achieving the KPI has been achieved. Any early part payment of a KPI shall be identified and agreed between the Contractor and Engineer under item 3 above.

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8 Bulk Earthworks

8.1 Scope

This section covers bulk earthworks requirements for landfill operations for all bulk earthwork material types that can be found within the landfill designation. It covers clearing the site, stripping topsoil, controlled filling, cut to waste, cut to stockpile and cut to fill, topsoiling and grassing, excavation of open drains and other related incidental work.

8.2 Standard Specifications

Construction work performed under this Section shall:

a) Comply with the general requirements of the latest revisions of the following documents:
   - NZS 4402 Methods of Testing Soils for Civil Engineering Purposes
   - BS 1377 Methods of Test for Soils for Civil Engineering Purposes
   - NZS 3111 Methods of Test for Water and Aggregate for Concrete

a Comply with the general requirements of the latest revisions of all other Standards, specifications and Codes of Practice referenced in these Contract Documents.

b Comply with the specific requirements of this Section and the Contract Drawings.

c Be carried out in full consideration of and in full compliance with the Resource Consents issued for this project.

The Specification shall be read in conjunction with the above Standards and documents, which are deemed to form a part of this Specification. In the event of any requirements of this Specification being at variance with any of the above Standards and documents then the requirements of this Specification take precedence.

8.3 General Requirements

8.3.1 Protection of Existing Liner and Gas Pipework

All earthworks are carried out above existing lined slopes. All excavation and filling shall be undertaken with great care to minimise damage to the existing liner and gas pipework. Suitable temporary protection shall be installed prior to commencing earthworks.

Any damage to the liner or gas pipework shall be repaired, in accordance with the specification and to the satisfaction of the Engineer, at no cost to the Principal.

8.3.2 Drainage & Erosion Control

All earthworks shall be carried out in fully drained conditions with no free water on the working surfaces. All preparatory excavation work and subsequent excavations in borrow areas or areas to be filled shall be kept effectively drained at all times. Cut and fill areas shall be sloped and graded adequately at all times so that they do not pond water or allow water to infiltrate. Temporary drains shall be installed or pumping carried out as necessary on a regular basis to remove or deflect water from the areas of operations, or to drain water as soon as it is seen to pond. If the Contractor considers it impracticable to maintain excavations or areas to be filled in a fully drained condition he shall propose, for the Engineer's approval, any measures to revise these drainage requirements.

Any fill or final excavation surface materials which have been allowed to become too wet or soft shall be removed and dried, or replaced. All fill surfaces shall be graded and rolled at the end of each

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day's work to prevent any ponding and erosion. Prior to commencement of the following day's filling operations, the previously graded and rolled surface shall be scarified by approved plant to remove any softened materials and to prevent the formation of sub-standard, or weak layers within the fill.

The Contractor shall ensure that appropriate sediment control devices are installed in the excavation areas, storage areas and the borrow sites and any other site used by the Contractor where sediment control devices are deemed necessary by the Engineer. These measures should be suitable for the removal of coarse sediments. The finer colloidal material will be treated in the sediment pond that services the whole site.

8.3.3 Dust Control

Earthmoving shall be carried out and haul roads and cut/fill areas maintained so that dust is not raised near or blown over the working area and adjacent properties. The site shall be kept watered as necessary to meet this requirement until covered by dust-free materials, mulch, or established grass cover. Dust control to carried in accordance with provisions identified in Erosion and Sediment Control Plan.

8.3.4 Sequence of Operation

Where a particular sequence of operation is required by the Principal or the Engineer (as indicated on the drawings or otherwise communicated, (e.g. landfill access ramp relocation) because of the nature of the Works, then the Contractor shall submit with his original programme a Methodology Statement which will include his preferred sequence of carrying out the Works. Any such statement shall be subject to the approval of the Engineer and shall comply with any internal completion dates or order of carrying out the Works set out in the tender. The Methodology Statement shall be updated from time to time as required by the Engineer.

8.3.5 Preservation and Maintenance

The Contractor shall preserve and maintain all earthworks, including partly completed earthworks, within their relevant specified standards, and shall make good, at his own cost, any earthworks which have deteriorated below the specified standards.

The Contractor shall carry out the works so as to minimise passage of construction plant over areas of fill or cut formed to final profiles. Areas of fill or cut that are softened or otherwise damaged due to repeated passage of construction plant shall be undercut and replaced. The Engineer shall inspect and approve the depth and extent of any such undercutting and the requirements for the replacement materials, which will be at the Contractor's own cost.

8.3.6 Tolerances

All earthworks shall be carried out to the lines, levels and grades shown on the Drawings. The accuracy of surfaces to be overlain by liner construction, specified fills and associated landfill structures shall be such as to preserve the minimum thicknesses of the overlying layers. Tolerances shall otherwise be as follows:

a)	Liner trim level and finished formation level	-50 mm to +10 mm
b)	Anchor trenches	-200 mm to +10 mm
c)	Drains	-50 mm to +50 mm
d)	Batter slopes	-100 mm to +100 mm
e)	General site drainage	-50 mm to +50 mm

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Additionally, finished earthworks surfaces shall be of neat and regular shape, free of abrupt irregularities.

8.3.7 Stockpiles

Surplus fill material shall be placed at locations agreed with the Contractor and the Engineer. All fill placed in the stockpile areas shall be track-rolled in layers not thicker than 1 m. Stockpiles surfaces shall be graded and rolled to prevent ponding.

8.4 Excavation

Excavation includes removal of vegetation and topsoil, excavation of fill from borrow areas, removal of unsuitable materials, and preparation for drains, and preparation for capping.

Excavated material will include existing engineered and non-engineered fill, in-situ soil and greywacke rock of all weathering grades. The majority of the excavation on the east and west sides of the site will be in greywacke rock of variable strength and weathering grades. High strength, less weathered rock may be encountered in the deeper excavations. This rock may require ripping.

The south side of the site overlays Stage 1 waste.

The Engineer reserves the right to instruct the Contractor to cease work in any area in the event that stability or other problems arise. The Contractor shall co-operate fully with the Engineer in programming excavations and altering excavation schedules as required to maintain optimum material performance and slope stability in both borrow and fill area. Work shall not recommence until approval is given by the Engineer.

8.4.1 Removal of Vegetation

The Contractor shall remove all vegetation from the site of earthworks, and shall clear all obstructions from the Site of the Works. Clearing shall mean the removal of all growth (other than grass and weeds), extraction of stumps, and other items remaining above the surface of the ground, and the complete disposal of all items. Extraction of stumps shall remove all roots greater than 25 mm diameter. The removal of grass and weeds shall be provided for under removal of topsoil.

8.4.2 Removal of Topsoil

The Contractor shall strip all grass, weeds, turf, organic topsoil, roots and the like from the areas subject to earthworks before other operations commence in these areas.

The stripped topsoil shall be separated from other stripped material and separately stockpiled for future reuse in locations approved by the Engineer. The stockpiles shall have maximum heights of 2 m, with slopes not steeper than 1V:2H and all changes of grade rounded to conform generally with the surrounding landscape.

The Contractor shall use appropriate equipment and procedures so as to avoid contaminating or otherwise affecting the topsoil's potential for reuse. In particular the Contractor shall:

- Use excavators and dump trucks to strip the topsoil, taking care to minimise trafficking the soil and causing unnecessary compaction;
- Not use scrapers without prior approval of the Engineer;
- Place and spreading the topsoil using excavators from dump trucks and spread by low-ground-pressure tracked equipment; and
- Not strip topsoil in wet weather or before topsoil has drained following rain.

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Stripping operations shall be carried out in a carefully controlled, systematic manner to minimise exposure of materials beneath the topsoil cover. The depth of topsoil stripping shall be sufficient to remove all organic material, turf, and significant plant roots such as to expose soil containing an insignificant amount of organic material to the approval of the Engineer. The Contractor shall determine the proposed stripping depth prior to starting operations, and shall avoid unnecessary over-excavation.

The Contractor shall not over excavate when stripping topsoil. The Engineer will inspect and direct.

8.4.3 Over Excavation

The Contractor shall direct his operations to avoid excavating beyond designated profiles. Any excavation beyond these profiles carried out without express instruction by the Engineer shall be made good to the direction of the Engineer with compacted fill of equal quality to that designated to cover the excavated profile. This reinstatement work shall be at no cost to the Principal.

8.4.4 Definition of Unsuitable Materials

Unsuitable materials are defined as those materials which because of their inherent properties or particular condition are unsuitable for use as engineered fill after every effort has been made in accordance with this Specification to utilise the material as engineered fill (except topsoil and waste fill). There may be other soils that require removal prior to filling, but they shall not be classed as unsuitable if they can with proper management, processing and conditioning be used as engineered fill. Materials will only be considered as unsuitable when so deemed by the Engineer.

Insofar as is practicable, all excavated material shall be used in the works or stockpiled separately according to their classification in designated areas for use in future works or by the Operations Contractor so that the quantity of unsuitable material is minimised.

Soils which as a result of the Contractor's careless operations are modified to fit the criteria described for unsuitable materials, will not be classified as such for measurement and payment purposes.

8.4.5 Preparation of Intermediate Cap to Receive Final Capping

Following any clearing and any stripping directed by the Engineer the intermediate cap shall be prepared to receive the final capping by removing any vegetation, scarifying the intermediate cap, filling of any hollows in the cap surface with final capping material and blading with a bulldozer at the direction of the Engineer. Care is to be taken not to reduce the thickness of the existing intermediate capping. When an acceptably smooth profile free of hollows and abrupt changes in grade has been achieved, the intermediate cap shall be compacted with a minimum of four passes of the roller to be used for compaction of the final capping material to achieve as firm a foundation for the final capping layer as possible. This preparation shall be carried out when the intermediate cap material has suitable water content in order to maximise the effectiveness of compaction. Wetting or drying may be necessary.

8.4.6 Definitions of Type 2A and R2 rock

Type 2A is slightly and less weathered sandstone silty sandstone and sandy siltstone which has joint spacing greater than 100 mm intermediate length and is strong (unconfined compressive strength of 50 MPa or greater). As a result of the joint spacing and hardness, the rock can be more difficult to excavate than Type 2 rock. The ‘as excavated’ Type 2A rock contains clast greater than 100 mm which cannot be readily broken down. It therefore does not meet the grading requirements of rockfill used in rockfill or geogrid reinforced rockfill unless it is broken down or screened to remove material greater than 100 mm.

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R2 rock is defined as per the TNZ F/1:1997 as follows *"rock which cannot be productively ripped unless equipment is used which is more powerful than a crawler tractor having net engine (or flywheel) power in the range 270-310 kW and fitted with a single shank hydraulic ripper. If a tractor meeting the above specification is not readily available then, a 30 tonne hydraulic excavator with a single ripper on the boom may be used to determine R2 materials, providing the performance of the hydraulic excavator has been compared with a crawler tractor in similar materials."*

Type 2A and R2 rock can be separately stockpiled for use by the Operations Contractor.

8.4.7 Cut to Waste

No excess material shall be removed from the Site without the written approval of the Engineer. All surplus material shall be retained on the Site.

If instructed by the Engineer, unsuitables and cut material other than topsoil and that required for fill or backfill shall be carted to the landfill or disposed of in a designated unstable stockpile. The Contractor shall liaise with the Landfill Operation Contractor prior to taking any material to the landfill active filling area. All material taken to the landfill shall be placed at the location agreed with the Landfill Operation Contractor and the Engineer.

8.5 Fill Placement

8.5.1 General

Fill materials shall be sourced from areas of cut or from designated borrow areas. If the Contractor wishes to propose materials from alternative sources then he shall provide details of such sources for the Engineer's approval. Material types are required to be selected, handled, blended, and compacted to meet the fill material specification and zoned fill as shown on the Contract Drawings or as instructed by the Engineer.

All filling shall be to the lines and levels shown on the Drawings or otherwise established by the Engineer. No fill may be placed until the foundation over which it is to be placed (which may be previously placed fill including waste cover on the Stage 1 landfill) has been inspected and approved by the Engineer. In the event of fill operations ceasing in any area on account of wet weather or for more than two days for any reason, the Contractor shall obtain the Engineer's approval of the condition of the fill surface before recommencing fill operations.

The Contractor shall take all precautions and maintain a tidy operation to minimise the presence of any loose, excavated materials that could become wet during rain. It is likely that considerable drying effort will be required for some of the materials if they become too wet to allow the required compaction criteria to be met. The Contractor shall also ensure that all fill is free of organic matter or other unsuitable material to the satisfaction of the Engineer.

8.5.2 Methodology

Prior to the programmed commencement of a bulk earthworks activity, the Contractor shall provide a methodology outlining the proposed filling methodology shall include details on the following:

a) Sequencing of operation
   - What is the proposed sequence of borrow excavation and fill placement around the site?
   - Position of access ramps and when they will be placed and removed?
   - How the fill will be preserved and maintained from traffic and the weather?

b) Materials

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- What will be done when materials with different properties are encountered?
- What compaction trials and testing will be undertaken on different materials?
- What systems are in place to ensure that unsuitable/organic materials are not incorporated into the fill?

c) Compaction control

- Control of water content
- Thickness of lifts
- Weave
- Sampling and testing
- What systems will be put in place to ensure that the correct number of passes is achieved?
- Compliance with the' as compacted grading', air voids, strength and other requirements of the specification

d) Subgrade preparation

- How will the subgrade be prepared?

e) Thickness of liner/tolerances

- How will the required thickness of liner to the tolerances required be achieved?

8.5.3 Foundation Preparation

The Contractor shall remove all unsuitable material to the satisfaction of the Engineer to expose a clean tight subgrade. The surface shall be proof-rolled to identify soft spots and these should be sub-excavated as directed by the Engineer and backfilled with compacted bulk fill, rock fill or drainage material as directed.

8.5.4 Conditioning and Spreading of Fill

No new fill shall be placed over previously placed fill that:

- has not achieved the required standard of compaction;
- has become contaminated;
- has deteriorated from the required fill standards; or
- requires testing and approval prior to placement of a new layer.

Previously placed fill that does not comply shall be reworked by scarifying, conditioning and re-compacting so as to meet the Specification or alternatively it shall be removed and replaced with complying material.

Positive and effective drainage shall be maintained during filling operations to minimize deterioration of material exposed in excavation areas and in the uppermost fill layers. Special care shall be taken to avoid hollows which could pond water. All fill surfaces shall be sealed off with rubber tyre plant when rain is imminent to minimise erosion and protect the fill from strength loss due to increase in moisture content.

Where fill is to be placed against sloping surfaces steeper than 1V : 2H, the sloping surface shall be excavated or "benched" such that horizontal benches at no greater than 0.5 m height intervals are formed. The sides of the benches shall be as close to vertical as practical. Benches shall be cut and prepared no more than one step ahead of the current layer of fill. Adjacent areas of filling shall be carried out such that at no time shall fill levels be more than 0.5 m different between the adjacent

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areas, unless approved by the Engineer. Within 1 m of the finished surface the bench height shall not exceed 0.2 m height.

In order to ensure adequate compaction of the materials forming the final fill surface profile, all fill batter faces shall be overfilled as necessary and carefully trimmed back to the required design profile. The excess material from trimming shall be stockpiled for reuse and not cut to waste.

8.5.5 Fill Materials

Note that the following fill 'types' are separate to the excavation 'classes' which are described in the previous section.

8.5.5.1 Type 1 Bulk Fill

Type 1 fill is a bulk fill material. Type 1 fill shall consist of clean soils (natural and fill materials), extremely weathered greywacke rock which the engineer defines are not suitable as Type 1A, 1B and 1C low permeability fill, and greywacke rock which is not suitable as rockfill.

Prior to compaction, all Type 1 fill material shall be broken into fragments of less than 100 mm. The material shall be spread uniformly in layers of less than 200 mm thickness, and conditioned to an appropriate average water content.

The Type 1 fill when sieved in accordance with NZS4402 Part 1, Test 9B shall comply with the following particle size grading limits. The particle size tests shall be undertaken on samples of placed and compacted fill material.

No material which is suitable for low permeability fill shall be used for Type 1 fill unless directed by the Engineer.

Particle Size (mm)	Percent Finer Than
100	100
75	94-100
53	86-100
37.5	77-100
19	59-100
13.2	49-100
9.5	42-100
6.7	36-100
4.75	31-100
2.36	23-100
1.18	18-100
0.6	14-100
0.3	8-98
0.15	3-95
0.075	0-91
0.05	0-86

8.5.5.2 Type 1A Soil

This low permeability fill type. Type 1A fill shall contain no rock greater than 19 mm after compaction, vegetation, topsoil or foreign matter. The Contractor shall avoid wastage of materials

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which would be suitable for Type 1A fill. The Contractor shall manage borrow operations to ensure that the excavations are drained effectively and materials are mixed and conditioned making all use of favourable weather. If the Contractor wastes such suitable materials and it becomes necessary, at greater cost, to use expanded or extra borrow areas, such greater cost will not be reimbursed. The Engineer reserves the right to instruct the Contractor as to material utilisation if, in the Engineer's opinion, the Contractor is not taking sufficient care to separate materials appropriately.

The Type 1A fill shall achieve a permeability of no greater than 1 x 10-9 m/s. The Type 1A fill when sieved in accordance with NZS4402 Part 1; Test 9B shall comply with the following particle size grading limits. The particle size tests shall be undertaken on samples of placed and compacted fill material.

Particle Size (mm)	Percent Finer Than
19	100
13.2	97-100
9.5	95-100
6.7	93-100
4.75	90-100
2.36	85-100
1.18	79-100
0.6	73-100
0.3	66-98
0.15	59-95
0.075	50-91
0.05	45-86
0.037	41-78
0.019	33-67
0.01	27-58
0.005	21-49

No gravel particle shall protrude from the prepared fill surface by more than 10 mm. Holes formed by the removal of stones shall be backfilled with soil and compacted to form a smooth liner trim surface.

8.5.5.3 Type 1B Soil

This low permeability fill type is suitable for final capping. Type 1B fill shall contain no rock greater than 19mm after compaction, vegetation, topsoils or foreign matter. The Contractor shall avoid wastage of materials which would be suitable for Type 1B fill. The Contractor shall manage borrow operations to ensure that the excavations are drained effectively and materials are mixed and conditioned making all use of favourable weather.

If the Contractor wastes such suitable materials and it becomes necessary, at greater cost, to use expanded or extra borrow areas, such greater cost will not be reimbursed. The Engineer reserves the right to instruct the Contractor as to material utilisation if, in the Engineer's opinion, the Contractor is not taking sufficient care to separate materials appropriately.

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Particle Size (mm)	Percent Finer Than
19	100
13.2	97-100
9.5	95-100
6.7	93-100
4.75	90-100
2.36	85-100
1.18	79-100
0.6	73-100
0.3	60-98
0.15	55-95
0.075	50-91
0.05	25-86
0.037	20-78
0.019	15-67
0.01	10-58
0.005	5-49

Type 1B fill shall achieve a permeability no greater than 1 x 10-7 m/s.

8.5.5.4 Type 1C Soil

This low permeability fill type. Type 1C fill is less weathered than either Type 1A or 1B. It consists of highly weathered siltstone and mudstone rock and extremely weathered silty sandstone. The material will form a low or moderate plasticity matrix supported clayey silt and sandy silt with gravel up to 50mm in its final compacted state. Type 1C material shall comply with the following particle sizing distribution.

Particle Size (mm)	Percent Finer Than
50	100
19	90-100
2.36 0.06	60-100 40-80
0.005	3-40

No gravel particle shall protrude from the prepared fill surface by more than 10 mm. Holes formed by the removal of stones shall be backfilled with soil and compacted to form a smooth liner trim surface.

Type 1C fill shall achieve a permeability no greater than 1 x 10-6 m/s.

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8.5.5.5 Type 2 Fill (Rockfill)

This material is selected moderately and less weathered, hard, durable greywacke rock. This material will be recovered from onsite borrows and shall be separately stockpiled for use in roading construction and formation of tipping pads. Any surplus Type 2 rock can be separately stockpiled for the use of the Operations Contractor. The stockpile location shall be agreed with the Engineer and the Operations Contractor.

The Type 2 Fill when screened in accordance with NZS4402, Part 1, Test 9B shall comply with the following particle size grading limits. The particle size tests shall be undertaken on samples as placed and compacted fill material.

Particle Size (mm)	Percent Finer Than
100	100
75	50 – 90
19	10 – 75
2.36	10 – 50
0.075	0 – 20

8.6 Compaction

Competent and well-experienced supervisors shall be provided by the Contractor to control procedures and shall carry out their duties primarily at the fill platform and not by delegation.

8.6.1 Equipment for all Types 1 fill

The Contractor shall employ appropriate compaction equipment to achieve the specified compaction. The procedures and number and type of construction plant necessary shall be confirmed by compaction trials. No subsequent changes shall be introduced without the prior approval of the Engineer.

Each layer shall be compacted to achieve effective bonding and avoidance of layering, such that the entire surface of any fill layer is properly compacted and uniform compactive effort is applied.

Compaction shall use protruding foot compactors to the satisfaction of the Engineer. This is required to breakdown the gravel clasts in the LPF and ensure knitting together of fill layers. The finished LPF surface shall be compacted with a smooth drum roller to provide a smooth uniformly graded fill surface free of asperities greater than 10 mm and suitable for receiving the geosynthetic liner.

The combined operations of spreading and compacting shall be undertaken using systematic and properly managed procedures, to the Engineer's approval, so as to ensure that each loose layer receives the required passes of the roller or other approved compaction equipment before further loose material is spread. The rate of fill placement shall not exceed at any time the productivity of available spreading and compaction plant.

8.6.2 Control of Water Content Types 1 fill

The water content of all fill materials shall be controlled so that there is no significant visible deformation, recoverable or non-recoverable, during equipment trafficking and compaction and no rutting after passage of plant. The design restricts the pore pressures which can be tolerated due to overly wet material and over compaction leading to weave.

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The fill shall be conditioned to an appropriate water content by aeration and drying or wetting (as the case may be), and/or by blending and mixing "wet" and "dry" materials. When soil is to be dried, the Contractor shall disc the soil and allow it to dry uniformly to its full depth. When the soil is to be wetted, this shall be done with sprinkling equipment ensuring uniform and controlled distribution of water through the full depth of fill the layer in conjunction with blading and discing. In all cases the fill shall be mixed and conditioned thoroughly so that immediately prior to compaction the material type and the water content of the fill is reasonably uniform within one area. The layers prior to compaction shall have all fragments less than 100 mm maximum dimension. Any costs of drying or wetting will be deemed to be included in the fill rate or other scheduled items. No extra payments will be made.

The LPF is prone to drying and cracking which reaches the permeability of the layer. The LPF shall be watered to ensure it does not crack between the placement and compaction and being covered by the other liner layers.

8.6.3 Compaction Requirements

Fill materials shall be compacted so as to achieve the standards defined below. The base of the excavation including the liner trim level shall also be compacted to the same strength requirement as the fill.

8.6.3.1 Types 1A and 1B Fill (LPF)

The compaction standard for Type 1A and 1B fill shall be:

i. average vane strength over 10 consecutive sets shall not be less than 110 kPa with no individual reading less than 100 kPa. A set is four or more individual tests taken within 0.5 m2. The average of these individual tests is the vane strength of the set. If there is a large variance between the individual tests, another test shall be undertaken within the 0.5 m2 to verify the test results.
ii. the air voids shall not exceed 10%;
iii. there shall be no noticeable weave of the compacted surface with a compaction plant of a minimum of 10 tonnes; and
iv. spread uniformly in horizontal layers not exceeding 200 mm loose thickness.
v. After compaction the grading specified in separate Section 8.5.5
vi. After compaction permeability requirements of the Specification Section 8.5.5
vii. The fill shall be spread uniformly in horizontal layers not exceeding 200 mm loose thickness.

8.6.3.2 Type 1C Fill (LPF)

The compaction standard for Type 1C fill shall be:

i. the number of blows to drive a Scala penetrometer from a depth of 50 mm to 200 mm below the fill surface shall not be less than 9. Where 1C material is cohesive, shear vane tests, specified in Item 8.6.3.1 (i), are preferred for Type 1C Fill. Where material is present that prevents the reliable use of a shear vane, such as gravel clasts, a Scala Penetrometer shall be used as per specification.
ii. the air voids shall not exceed 8%;
iii. there shall be no noticeable weave of the compacted surface with a compaction plant of a minimum of 10 tonnes; and
iv. spread uniformly in horizontal layers not exceeding 150 mm loose thickness.
v. After compaction the grading specified in the specification section 8.5.5

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vi. After compaction Type 1C fills are required to meet the permeability requirements of the Specification Section 8.5.5.

The Type 1C shall be spread uniformly in horizontal layers not exceeding 150 mm loose thickness.

8.6.3.3 Type 1 Bulk Fill

The compaction standard for Type 1 Fill that is predominately granular material consisting of highly to moderately and less weathered greywacke and extremely weathered sandstone shall be:

i. the in-situ density shall be not less than 95% of the maximum dry density for standard compaction, as determined by Test 4.1.1 NZS 4402;
ii. Water content of ± 2% of optimum water content (to be confirmed in the compaction trial);
iii. the number of blows to drive the Scala penetrometers from a depth of 50 mm to 200 mm below the fill surface shall not be less than 7; and
iv. there shall be no noticeable weave of the compacted surface with a compaction plant of a minimum of 10 tonnes.
v. The fill shall be spread uniformly in horizontal layers not exceeding 200 mm loose thickness.
vi. The average air voids percentage over 10 consecutive readings shall not be more than 8%, with no individual reading greater than 10%.

d Type 1 fill will be variable and so careful attention to the type of material is required when undertaking field testing to ensure the appropriate maximum dry density and solid densities are used for the NDM.

8.6.3.4 Type 2 Rock Fill

The compaction standard for Type 2 fill shall consist of moderately and less weathered blocky. The compaction standard for Type 2 fill shall be:

i. the in-situ dry density shall be not less than 98% of the maximum dry density for standard compaction, as determined by Test 4.1.1, NZS 4402;
ii. There shall be no noticeable weave of the compacted surface with a compaction plant of a minimum of 10 tonnes.
iii. A clegg hammer is to be used to prove consistency of compaction for each layer. The clegg value will be determined during the Compaction trials.
iv. The fill shall be spread uniformly in horizontal layers not exceeding 200 mm loose thickness.
v. Spread uniformly in horizontal layers not exceeded 200 mm in loose thickness.

8.6.4 Compaction Trial

Prior to commencing construction on any low permeability fill, the Contractor shall construct a compacted clay liner test pad on an area of the site agreed with the Engineer.

The Engineer shall be notified at least 1 week in advance of the test pad construction to allow for earthworks quality control testing staff to be in attendance. The test pad shall be constructed at least 3 weeks prior to placement and compaction of the LPF fill in the works to allow time for laboratory testing of samples from the test pad and assessment of results by the Engineer.

The test pad shall be a minimum of 20 m long, 5 m wide. The pad shall comprise the spreading and compacting of a minimum of 4 superimposed, 150 mm loose thickness layers. The subgrade for the test pad shall be clear of any vegetation, obstructions, topsoil, or aggregate and shall be relatively planar so that accurate control of the liner depth can be achieved.

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The test pad shall be constructed with the equipment and methods proposed for the liner construction so as to replicate the construction situation as closely as possible. The trial pad shall use protruding foot roller or similar. The area of the compaction trial shall be sufficient to allow construction procedures and compactive effort to be representative of those proposed for the permanent works.

In constructing the test pad, the Contractor shall demonstrate to the Engineer that it can reliably and repeatedly meet the requirements of the Specification in respect of moisture conditioning and compaction of the liner. The test pad will be sampled and tested by the Engineer for compliance with the grading and permeability criterion in the specification. As well as achieving a regular and smooth surface finish suitable for receiving geomembrane.

If the test pad fails to meet the specified requirements, the Contractor shall construct additional test pads at its own cost until a suitably reliable methodology has been demonstrated.

The Contractor shall allow for at least 1 day in its programme for obtaining the fill material from the borrow and completing the test pads.

The Contractor shall document the agreed methodology and send a copy to the Engineer for approval. Once approved, this methodology shall only be changed with the approval of the Engineer.

Separate trials will be necessary for each distinct fill material type and ongoing compaction trials may become necessary as the works proceed and/or where other fill types are accessed or identified. The Contractor shall keep the Engineer informed of fill material types being used or encountered during the course of the works and, depending on the materials encountered, the Engineer may instruct additional compaction trials be carried out.

8.7 Testing

8.7.1 General

Where field tests indicate that the specified standard of compaction has not been achieved, corrective action shall be taken to bring the fill to the required standard and as required by the Engineer. This may require the affected fill to be reworked by scarifying, conditioning and re-compacting so as to meet the specification or alternatively it may need to be removed and replaced with complying material. All costs associated with the re-testing of any fill areas which fail to meet the specified standards will be a charge to the Contractor and will be deducted from progress payment certificates. Such costs will include all related supervision and administration time incurred by the Engineer and his staff in determining the extent of compacted fill failing to meet the specified standards, its subsequent re-testing and the effecting of the appropriate advice to all parties concerned.

At any time either prior to or during the course of construction, the Engineer may direct modifications to the compaction criteria, with the object of ensuring that the optimum compaction criteria for the particular materials and conditions being encountered or likely to be encountered are achieved.

The Contractor shall rework and re-compact any area disturbed by any testing undertaken within the site, to the Engineer's approval.

The locations and levels of all in-situ tests shall be recorded within tolerances of 1.0 m horizontally and 0.1 m vertically. The Contractor shall make every effort to ensure an even spread of test locations, both vertically and horizontally, through all fill areas. Spatial separation of tests within the completed fill areas shall be such that at least one set of tests is completed within any given continuous 0.5 m thickness of fill. For the purposes of this clause a "fill area" is defined as the area or zone of continuous fill placed on a particular working day.

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All testing, both in-situ and laboratory, is to be carried out using an IANZ accredited testing organisation, with all equipment calibrated to relevant standards at the required frequency. Full details of the proposed testing organisation(s) shall be submitted to the Engineer for his approval.

8.7.2 Testing Procedure

The Contractor shall be responsible for ensuring that the specified compaction parameters are achieved and shall carry out such testing as is needed to ensure the consistent quality of the fill. The tests to confirm the Contract requirements shall be undertaken using the methods defined in Table 8.1 below. The Engineer may approve more approximate and rapid methods on a day-to-day basis for preliminary assessment. Results obtained by rapid methods shall not be used for final acceptance purposes unless approved by the Engineer.

The tests have been defined for the materials expected to be used for the construction of the works. Should alternative materials be proposed by the Contractor then he shall also propose appropriate quality control testing methods and procedures in order to demonstrate to the Engineer's approval that the necessary design criteria can be achieved.

8.7.3 Tests and Test Methods

Table 8.1: Testing Methods

Parameter	Test Description	Test Method
In-situ Density[1]	Field Compaction	NZS 4407:1991, Test 4.2.1 (Nuclear Densometer Direct Mode) NZS 4407:1991, Test 4.2.2 (Nuclear Densometer Backscatter Mode)
Maximum Dry Density & OMC determination	Standard Compaction	NZS 4402:1986, Test 4.1.1
	Heavy Compaction	NZS 4402:1986, Test 4.1.2
Strength	Scala Penetrometer	NZS 4402:1986, Test 6.5.2
	Pilcon Shear Vane[3]	NZ Geotechnical Society Inc. 2001 "Guideline for hand held shear vane"
	Clegg Impact Test	ASTM D5874-95
Air Voids	Air Voids	NZS 4402:1986 involving intermediate tests 4A, 4B, 4C
Permeability	Laboratory Triaxial Permeability	BS 1377 Part 5 and Part 6 (1990)
	In Situ	Infiltration test, BRE Digest 365m Test 2.7.1
Solid Density[4]	Solid Density	NZS 4402:1986, Test 2.7.1
Moisture Content[5]	Moisture Content	NZS 4402:1986, Test 2.1
Particle Size Distribution	PSD Wet Sieving[6]	NZS 4402:1986, Test 2.8.1
	Hydrometer	NZS 4402:1986, Test 2.8.4

Note 1: The air voids content of the compacted soil at any test location shall be taken as the mean of the air voids results from a set of in-situ density tests. A set of density tests shall comprise two or more individual tests made within an area of 0.5 m^2. Where vane shear strength tests are being conducted in conjunction with in-situ density tests, the in-situ density tests shall be performed within the same 0.5 m^2 of area as the associated shear tests but in positions undisturbed by any prior vane tests.

Note 2:

a an air voids test result may be calculated immediately after testing, by assuming a value for the soil water content derived by applying a correction to the nuclear gauge water content, based on a correlation developed over 15 previous most recent relevant tests between the nuclear densometer water content and the oven water content – the water content correlation must be renewed each time the air voids correlation is renewed;

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b a separate correlation shall be developed for each soil material type if this method is to be used; and

c a set shall comprise 2 measurements using the same probe hole but oriented at 90° to each other.

Note 3: The vane shear strength of the soil at any test position shall be taken as the mean of the results of a set of tests. A set of shear tests shall comprise four or more individual tests made within an area of 0.5 m^2. Vane Shear test method:

a Before a new shear vane is first used it should be calibrated to obtain values of torque vs spring deflection. It should be recalibrated at intervals of not more than 12 months;

b The vane shear strength of the soil must be derived in accordance with the method described in BS 1377:1990, Clause 3.4;

c Vane shear strengths based on vane manufacturer's empirical calibrations shall not be used;

d Hand operated vanes of nominal size H = 29 D = 19 and area ratio > 12% may be used provided that the strengths are derived in accordance with BS 1377:1990 Part 9, Method 4.4 (sample calculation 4.4.5);

e For hand operated vanes of this size the head of the vane may be rotated at a uniform rate of approximately 10 degrees per second; and

f During penetration or testing with the shear vane, every effort shall be made to avoid any gravels present in the fill. If it can be demonstrated that any single test is influenced by the presence of gravels, that single test shall be noted but the result disregarded for acceptance purposes.

Note 4: In the water content test the oven performance and forced ventilation requirements shall be waived provided that operating temperature range is verified and checked daily. Before the mass of a dried sample is accepted, it shall be dried for at least 14 hours, and be weighed at least twice at periods not less than four hours apart until the loss in mass between successive weighing is less than 0.1 grams per 100 grams.

Note 5: The solid density test shall be performed using a sample at natural water content, not an oven-dried sample.

Note 6: The minimum mass of sample taken for PSD Wet Sieving will be dictated by the maximum size and grading of the material but the total mass shall be such that it is representative of the material being tested and the mass shall in no case be less than that specified in NZS 4402 Part 1:1980 Clause 1.5.8. NZS 4402 Part 1:1980 states that "... on sieves coarser than 19 mm, testing individual particles to see if they will fall through is permitted". Hence, after washing, very coarse gravels and boulders may be sorted into the specified size fractions by the above procedure using a series of single square apertures of appropriate sizes made of rigid metal and complying with BS 410.

8.7.4 Frequency of Testing

The frequency of testing shall be as described below (Table 8.2) and is the minimum considered acceptable. Additional tests and/or changes to the testing frequency may be instructed by the Engineer as the works proceed.

Notwithstanding the requirements of this Specification, the Engineer may carry out check tests of compaction at any time. The Contractor shall stop or divert machinery as required by the Engineer to allow the tests to be carried out.

As soon as the Engineer is satisfied that the materials are consistent and work is being carried out in a systematic and consistent manner, he / she may reduce the frequency of testing as he judges to be appropriate.

Table 8.2: Minimum Testing Frequency

Parameter	Test Type	Purpose	Test Frequency
Strength	Shear Vane	Shear Strength	1 set per 200 m^3 and 1 set per 0.5 m lift in cohesive fill
	Clegg Impact Hammer	Shear Strength	1 set per 200 m^3 and 1 set per 0.5 m lift in granular fill
	Scala Penetrometer	Shear Strength	1 set per 200 m^3 and 1 set per 0.5 m lift in granular fill
In-situ Density	Field Compaction with Moisture Content	Compaction Compliance	1 set per 200 m^3 and 1 set per 0.5 m lift and 1 set for each material type

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Particle Size Distribution	Wet sieving	Grading Compliance	1 initial test for each material type and then 1 test per 1,000 m^3 for Type 1 and 2 fill, and 1 test per 500 m^3 for LPF and drainage materials
Solid Density	Solid Density	Measurement of Air Voids	1 initial test for each material type
Maximum Dry Density & OMC determination	Standard compaction	Measure optimum water content and maximum dry density	1 initial test for each material type
Maximum Dry Density & OMC determination	Heavy compaction	Measure optimum water content and maximum dry density	2 initial tests for Type 1C fill
Permeability	Laboratory Triaxial Permeability	Permeability Compliance	1 test at the start of material placement per 1,000 m^3 for LPF materials

8.8 Topsoiling and Grassing

8.8.1 Handling and Placing Topsoil

Topsoil shall not be handled or worked when plastic (mouldable), unless directed by the Engineer. Where it is necessary to place the topsoil when plastic, the soil shall be loosely deposited across the Site, then allowed to dry before being worked. All traffic shall be kept off the topsoil when plastic.

For the placement of topsoil, the Contractor shall use low ground pressure equipment such as tracked vehicles, in preference to wheeled vehicles. Prior to commencing this, the Contractor shall scarify the prepared subgrade to a maximum depth of 50 mm. These surfaces shall be left in a loose condition until ready to accept the topsoil.

Topsoil shall be spread over all areas to be revegetated to a minimum thickness of 150 mm. Spreading shall not be done when the ground or the topsoil is excessively wet or otherwise in a condition detrimental to the work.

All topsoil shall be smoothed with a chain harrow towed by a light tractor or similar to eliminate all minor depressions and wheel marks and to produce a smooth evenly graded open textured surface which will not hold water.

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9 Trenching, Bedding, and Backfilling for Underground Pipes

9.1 Scope

This Clause details the requirements for trenching, bedding and backfilling for underground pipes as specified in these Specifications.

Where the words pipe, pipelaying, pipework, etc., are used in this Clause to determine phases of work, those words shall include duct, duct laying, duct work, etc., as applicable.

9.2 Compliance

Construction work performed under this Clause shall comply with the general requirements of the following documents and the specific requirements of this Clause:

- Code of Practice for the Construction of Underground Pipe Sewers and Drains (NZS 4452).
- The Health and Safety at Work Act 2015.
- Excavation Guide, Safety in Construction No. 5.
- Local Authority standards.
- Code of Practice for Safety in Excavation and Shafts for Foundations.

9.3 Materials

The requirements for bedding and backfill Materials shall be as specified on the Drawings. Where excavated material does not meet the requirements for backfill, suitable Material meeting these requirements, and being compatible with adjacent materials, shall be imported.

9.3.1 General

All filter/drainage material to be used in underdrains, leachate drains and elsewhere as designated on the Drawings or directed by the Engineer shall be clean, durable, unweathered gravel and imported from an approved external source. Drainage materials shall be carefully processed to avoid gap grading. All drainage materials shall meet the following requirements.

9.3.1.1 Crushing Resistance

The minimum crushing resistance shall not be less than 130 kN when the aggregate is tested according to NZS 4407 Test 3.10 “Crushing Resistance of Coarse Aggregates under a specified load".

9.3.1.2 Weathering Resistance

The aggregate shall have a quality index of AA, AB, AC, BA, BB or CA when tested according to NZS 4407 Test 3.11 Weathering Quality Index of Coarse Aggregate".

9.3.2 “Type A” Drainage Material

Type A drainage Material is to be used in subsoil drains.

The “Type A” drainage Material when tested in accordance with NZS 4402 Part 2 shall comply with the following grading:

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Table 9.1: Type A drainage material grading

Test sieve aperture (mm)	Percentage passing
26.5	100
13.2	85 - 100
9.5	80 - 95
4.75	65 - 85
2.36	50 - 70
1.18	35 - 55
0.6	18 - 40
0.3	3 - 25
0.15	8 max
0.075	0

9.3.3 20/10 Drainage Gravel

20/10 drainage gravel is to be used in the leachate collection layer and for leachate collection drains.

The 20/10 drainage gravel shall be angular and shall be washed and when tested in accordance with NZS 4402 Part 2 shall comply with the following grading:

Table 9.2: 20/10 drainage gravel grading

Test sieve aperture (mm)	Percentage passing
26.5	100
19	85 - 100
16	60 - 77
13.2	20 - 25
8.5	0 - 10
4.75	0 - 5

9.3.4 40/20 Drainage Gravel

40/20 drainage gravel is to be used in the surround to gas lateral collectors and in gas wells.

40/20 drainage material shall be washed and when tested in accordance with NZS 4402 Part 2 shall comply with the following grading:

Table 9.3: 40/20 drainage gravel grading

Test sieve aperture (mm)	Percentage passing
53	100
37.5	90 - 100
26.5	60 - 72
19	22 - 62
16	12 - 27
13.2	7 - 24

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Test sieve aperture (mm)	Percentage passing
8.5	1 - 5
4.75	0 - 5

9.3.5 Testing Frequency

Drainage materials are to be tested by the Contractor.

The frequency of testing of drainage materials shall be as follows:

Table 9.4: Test frequency

Test	Purpose	Initial Frequency	Min. Testing Frequency
Particle size analysis	Grading compliance of drainage materials	1 No. passing test over and above supplier tests to be provided prior to import and use.	1 per 1,000m^3

9.4 Construction

9.4.1 Trenching

9.4.1.1 Excavation

Trenches shall be excavated in accordance with the Drawings, and as specified below.

For nominal pipe diameters less than 700 mm, trench sides shall be vertical from the pipe invert to at least 150 mm above the pipe crown.

For nominal pipe diameters between 700 mm and 1000 mm, the maximum trench width at the crown of the pipe shall be O.D. + 500 mm.

Shoring shall be provided as necessary to ensure the security of the work and safety of workers, and to comply with the Health and Safety at Work Act and its related Regulations and Codes of Practice. If, for any reason, the sides of a trench collapse, the Contractor shall at his own expense carry out all necessary remedial work.

Trench excavation shall be carried out expeditiously, and subject to all specific requirements of the Contract.

Excavated material shall be stacked well clear of the edge of the excavation and the size of the stockpile shall be limited to avoid any danger to the stability of the trench or adjacent services and facilities. Any surplus material shall be disposed of in the Landfill at a location agreed with the Engineer.

The Contractor shall not open the trench more than fifty metres ahead of pipe laying and, where soft ground is encountered, not further than approved by the Engineer.

If the Contractor by his own negligence over-excavates any area, then it may be necessary to carry out remedial filling, with an approved material to achieve the original in-situ density, at no additional cost to the Principal.

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9.4.1.2 Water in Trenches

Should water be present in a trench, the level shall be kept below the level of the top of the bedding until each joint has been made and backfilled.

The Contractor shall provide adequate plant as required to remove and dispose of water without interfering with pipe laying work. Where the trench is in natural soil the water may be disposed of to the site stormwater system. Where the trench is in waste, or waste contaminated soil, water shall be disposed of into the leachate system or, subject to the approval of the Engineer, into filled waste or the Landfill working area.

The Contractor shall not permit any flooding of property, footpaths, or roadways to result from pumping operations. All water shall be disposed of at the nearest adequate and approved drain point. Pumping of sand and silt from excavations shall be avoided by providing a suitable trap to prevent such action. Any material inadvertently deposited in adjacent services or surface areas shall be removed immediately.

The Contractor shall take precautions to prevent flotation of pipes in locations where open trench excavations may become flooded. The precautions may include partial backfilling of the trench leaving pipe joints exposed while awaiting testing of the joints.

9.4.1.3 Unsuitable Foundation

Where the material in the trench bottom is not suitable for a pipe foundation (except when excavating a trench in waste), the Contractor shall upon receipt of an order from the Engineer over-excavate the trench as necessary and backfill with an approved compacted granular bedding material.

If the natural bottom of the trench becomes weakened or disturbed by the Contractor's own operations, then he shall undertake all necessary remedial action to strengthen the foundation with approved compacted granular backfill at his own cost.

Unsuitable excavated material shall be loaded out and disposed of immediately in the Landfill.

9.4.1.4 Maintenance of Trenches

Where trenches are excavated under this Contract for pipes or services to be supplied and laid by others, the open trenches shall be maintained as part of this Contract.

9.4.2 Bedding in Trench Conditions

Bedding shall not commence until the base of the trench has been inspected and approved by the Engineer.

Bedding material shall be spread evenly on the trench invert and well compacted. The bedding shall be shaped to receive the pipe which shall bear firmly on the bedding along the full length of the pipe barrel with at least 180 degrees of the pipe circumference embedded in the bedding. Socket holes shall be provided beneath each pipe joint to permit jointing of the pipe and allow the barrel to rest firmly on the bedding. The types of bedding and drainage materials as bedding or surround to pipes are defined on the Drawings.

9.4.3 Placement of Drainage Materials

Drainage media shall be placed around pipes and worked so as to achieve the lines and levels shown on the Drawings or instructed by the Engineer. Compaction of drainage media is not required other than to avoid formation of unnatural voids and care shall be taken to avoid segregation of graded drainage materials.

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9.4.4 Backfilling of Trench

Backfilling and surface reinstatement of the trenches shall commence as soon as possible after laying, inspection and testing (if applicable), of each section of pipeline. Each trench shall be backfilled with an approved material as defined in the Bulk Earthworks Specification and instructed by the Engineer (will depend on the application).

Where backfill material is in intermediate or final cap, the trench backfill shall be compacted to ensure the backfilled material marries into the existing cap and there are no vertical seams in the cap. Backfill material shall be placed, selected and compacted in accordance with the Bulk Earthworks Specification.

9.4.5 Reinstatement

Ground disturbed by works constructed under this Clause shall be reinstated to its pre-Contract condition, or to such other condition as the Engineer may instruct. Where trenches are excavated in grassed areas including the Landfill cap, topsoil shall be stripped and stockpiled when excavation is carried out and then reinstated over the trench backfill and grass seeded.

All excess excavated material and any other material not used in the Works shall be carted away and disposed of to one of the existing stockpiles on site. The appropriate stockpile for each material type shall be identified by the Engineer.

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10 Protection/Separation Geotextiles and Geogrid Reinforcement

This section covers the work necessary to supply and install the protection and separation geotextiles and geogrid reinforcement required as part of the lining system including supply, transport, storage, installation, and protection.

10.1 Standard specifications

Construction work performed under this Section shall comply with the general requirements of the following documents and the specific requirements of this Section:

- GRI GTI 12(a): Test Methods and Properties for Nonwoven Geotextiles Used as Protection (or Cushioning) Materials;
- ASTM Standard D 4873: Standard Guide for Identification, Storage and handling of Geosynthetic Rolls;
- TNZ F/7:2003: Specifications for Geotextiles;
- TNZ F/7 Notes:2003: Notes to the Specification for Geotextiles.

10.2 Materials

Protection and separation geotextile shall be non-woven and incorporated in the lining works as indicated on the drawings. Such geotextiles shall be a polymeric fabric formed from a plastic yarn of a long-chain synthetic polymer composed of 100% by weight of propylene and shall contain stabilisers and/or inhibitors added to the base plastic to make the filaments resistant to deterioration due to ultraviolet and heat exposure, as set out below. Polyester geotextiles are not acceptable.

The fibres shall be rot proof, chemically stable and have low water absorbency.

The filter network must be dimensionally stable (i.e. fibres must maintain their relative position with respect to each other) and resistant to delamination. The geotextile shall be free of defects or flaws which significantly affect its physical properties.

10.2.1 Protection Geotextile

The protection geotextile shall be used to cover the HDPE liner and shall meet the following minimum requirements:

The geotextile shall meet the following minimum requirements:

- Nominal mass per unit area (ASTM D5261 or ISO 9863) – Typical 1,000 g/sq.m
- Wide strip tensile strength (AS 3706.2/ISO 10319/ASTM 4595) - Minimum 50 kN/m
- Grab tensile strength (AS 3706.2/ASTM 4632) – Minimum 2.5 kN
- Trapezoidal tear strength (AS 3706.3/ASTM 4533) – Minimum 1.2 kN
- CBR burst strength/puncture strength (AS 3706.4/ISO 12236)/ASTM D 6241) – Minimum 9.0 kN
- UV resistance at 500 hours (AS 3706.11 or ASTM D4355 or ASTM D7238) – minimum 70% of strength retained.

Notes:

1 All values are minimum average roll values (MARV) except UV resistance which is a minimum value.

2 Wide strip tensile strength and Grab tensile strength shall be reported for both machine and cross directions.

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Suitable geotextile include ProFab AS 1000X, Titan TE-GTP1000, Terratex 1850k and other products complying with the above criteria and as approved by the Engineer.

10.2.2 Separation Geotextile

The separation geotextile shall be used to cover leachate gravels at landfill base and benches and shall meet the following minimum requirements:

- Mass per unit area (ASTM D5261 or ISO 9863) – Typical 200 g/sq.m
- Wide strip tensile strength (AS 3706.2/ISO 10319) – Minimum 12.5 kN/m
- Grab tensile strength (AS 3706.2) – Minimum 800 N
- Trapezoidal tear strength (AS 3706.3) – Minimum 300 N
- CBR puncture resistance (ISO 12236)/CBR burst strength (AS 3706.4) – Minimum 2,200 N
- UV resistance at 500 hours (ASTM D4355 or ASTM D7238) – minimum 70% of strength retained.
- Pore Size (O95) (AS 3706.7) – Typical 80 μm
- Permittivity (AS 3706.9) – 2.65 s^{-1}
- Coefficient of Permeability (AS 3706.9) – 43 x 10^{-4} m/s
- Flow Rate @ 100mm Head (AS 3706.9) – 265 l/sq.m/s

Notes:

3 All values are minimum average roll values (MARV) except UV resistance which is a minimum value.

4 Wide strip tensile strength and Grab tensile strength shall be reported for both machine and cross directions.

Suitable geotextile include Bidim A19, and other products complying with the above criteria and as approved by the Engineer.

10.2.3 Geogrid Reinforcement

The geogrid reinforcement shall be used in conjunction with and installed directly above the protection geotextile and shall meet the following minimum requirements:

- Characteristic initial strength, Tu (ISO 10319) – Minimum 40 (MD/XD)
- Characteristic initial strength at 5% strain, (ISO 10319) – Minimum 20 (MD)
- Strain at initial strength (ISO 10319) – Typical 10%

Suitable geogrid include TenCate Miragrid GX 40/40 and other products complying with the above criteria and as approved by the Engineer.

10.3 Manufacturer's Quality Control

The Contractor shall provide details of the manufacturer's manufacturing quality control systems for all geotextiles used in the Permanent Works. The Contractor shall supply recent test data confirming compliance with the requirements of these Specifications undertaken by the manufacturer, including test data on material delivered to the site and incorporated into the permanent works.

10.4 Delivery, Storage and Handling

Prior to purchase and delivery of geotextiles to the site, the Contractor shall provide the following information to the Engineer for approval:

i. Product name, grade and manufacturer;

ii. Product material properties meeting the minimum specification requirements;

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iii. Manufacturing quality assurance test results (post delivery and prior to installation).

Storage and handling of geotextile shall be in accordance with the manufacturer's recommendations and generally in accordance with ASTM Standard D 4873, "Standard Guide for Identification, Storage and handling of Geosynthetic Rolls." In addition, the fabric shall in no case be exposed to heat or direct sunlight to the extent that its strength or toughness are diminished. The wrapper is to remain on rolls prior to use and geotextile which is not to be installed immediately shall be stored indoors or under cover.

Geotextile shall not be stored directly on the ground. The storage area shall be such that the geotextile is protected from mud, soil, dust, debris and direct sunlight. Geotextile shall not be left exposed to sunshine and weather for longer than one (2) weeks prior to covering. Temporary measures to protect the geotextile prior to its coverage shall be taken as necessary. Torn or punctured geotextile shall not be used.

10.5 Installation

Care shall be taken to avoid any damage to the geotextile at any stage of the installation procedure. Small areas of damaged geotextile shall be replaced with patches with a minimum 300 mm overlap to the damaged area heat bonded or stitched in place. If damage covers a large area or patching is not possible, the geotextile shall be replaced.

Where geotextiles and geogrid are laid on slopes, rolls shall be laid parallel to the direction of the slope, i.e. longitudinal joints perpendicular to contours. Horizontal joints on slopes are not permitted unless specific joining details are approved by the Engineer. Laps between sheets shall be a minimum of 400 mm or the manufacturer's recommended dimension, whichever is greater.

Geotextiles shall not be left exposed to sunshine and weather for longer than 14 days prior to covering and typically the amount of geotextile deployed should not exceed the amount to be covered on the day of deployment. Where geotextile is to be left exposed for longer than 14 days, it shall be covered with a temporary sacrificial layer of geotextile or plastic sheeting. Geotextile that has been exposed to excessive heat or direct sunlight beyond the maximum exposure time shall be replaced at no additional cost to the Principal.

The surface onto which geotextiles are placed are to be free of material that may damage the geotextile during installation or in service and cover material is to be placed carefully to avoid damage.

The geotextiles is to be placed in intimate contact with the surface on which it is laid and shall not be stretched or bridged over lumps or hollows. Operation of plant directly on geotextiles shall not be permitted.

Installed geotextiles and geogrid shall be adequately secured to prevent uplift or damage from wind prior to it being permanently covered with leachate drainage aggregate (protection geotextile) or waste (separation geotextile). The Contractor shall leave a 2 m runout length of geotextile and geogrid from the crest of the slope to allow for movement of the geotextile and geogrid after waste placement. The Contractor shall roll the 2 m excess into a coil and weigh down with sandbags or similar. Under no circumstances shall the Contractor drive waratahs into the clay liner to secure the geotextiles and/or geogrid. Driving of warratahs shall only be allowed beyond the clay liner at the crest of the slope. Daily Records

The Contractor shall keep daily records of geotextiles and geogrid placement to be submitted to the Engineer on the following Working Day. The record shall include the following details:

i. Date

ii. Area and location of geotextiles and geogrid placement

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iii. Confirmation of prior final acceptance of the founding layer for placing of the geotextiles and geogrid

iv. Details and location of any repairs

v. Any variations to the approved Method Statement

The form of the daily records shall be agreed with the Engineer and incorporated within the Contractor's Method Statement and Quality Plan specified in Clause 1.8.

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Appendices

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A - Historical Waste Data

RELEASED UNDER THE LOCAL GOVERNMENT AND MEETINGS ACT 1987

B - Hutt City Council Bylaws

RELEASED UNDER THE LOCAL GOVERNMENT AND MEETINGS ACT 1987

C - Hazardous Waste Disposal Record

RELEASED UNDER THE LOCAL GOVERNMENT AND MEETINGS ACT 1987

D - Conductivity and Surface Water Monitoring

RELEASED UNDER THE LOCAL GOVERNMENT AND MEETINGS ACT 1987

E - Reports and Inspection

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Schedule 23 – Contract Drawings

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on Issue

Rev	Title
B	DRAWING LIST AND LOCATION PLAN
B	SITE PLAN
B	EXISTING LEACHATE NETWORK
B	EXISTING STORMWATER NETWORK
B	EXISTING GAS COLLECTION SYSTEM
B	OPERATIONAL FILLING PLAN - SLOPE 9
B	OPERATIONAL FILLING PLAN - SLOPE 10
B	PHASE 1-5 INDICATIVE SEQUENCE PLAN
B	PHASES 1-5 INDICATIVE LONG SECTION
S DESIGN	
B	GENERAL ARRANGEMENT PLAN
B	STORMWATER PLAN
B	LONGSECTION AND TYPICAL CROSS SECTIONS
B	STANDARD DETAILS SHEET 1 OF 3
B	STANDARD DETAILS SHEET 2 OF 3
B	STANDARD DETAILS SHEET 3 OF 3

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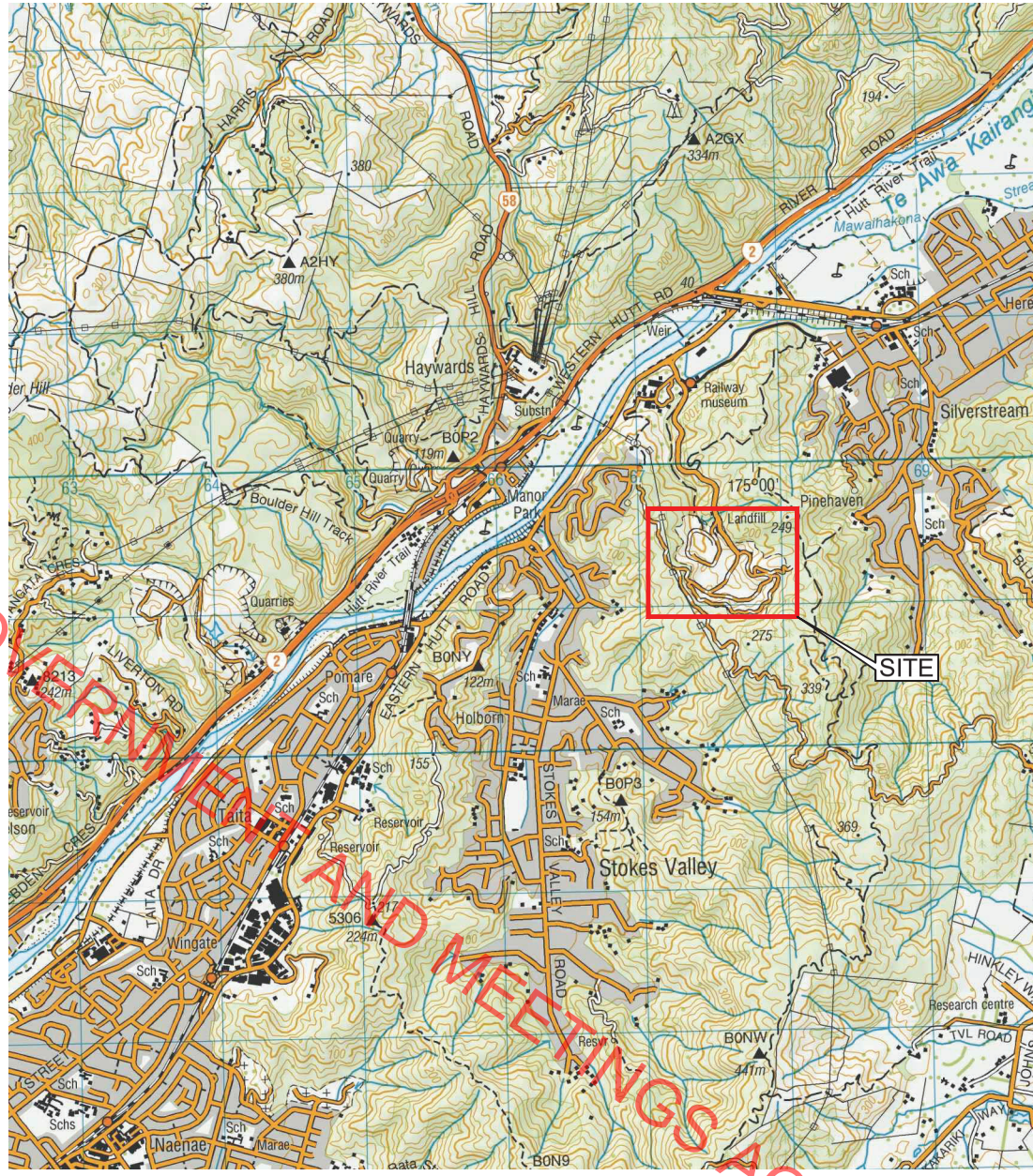

TOPOMAP SOURCED FROM LINZ DATA SERVICE <https://data.linz.govt.nz/layer/50767-nz-topo50-maps/> , LICENSED BY LINZ FOR RE-USE UNDER THE C COMMONS ATTRIBUTION 4.0 NEW ZEALAND LICENCE (CC BY 4.0). ACCESSED 09/12/2021.

LOCATION PLAN
SCALE 1:50000

s issue: 18/01/2023

3.0 (km)

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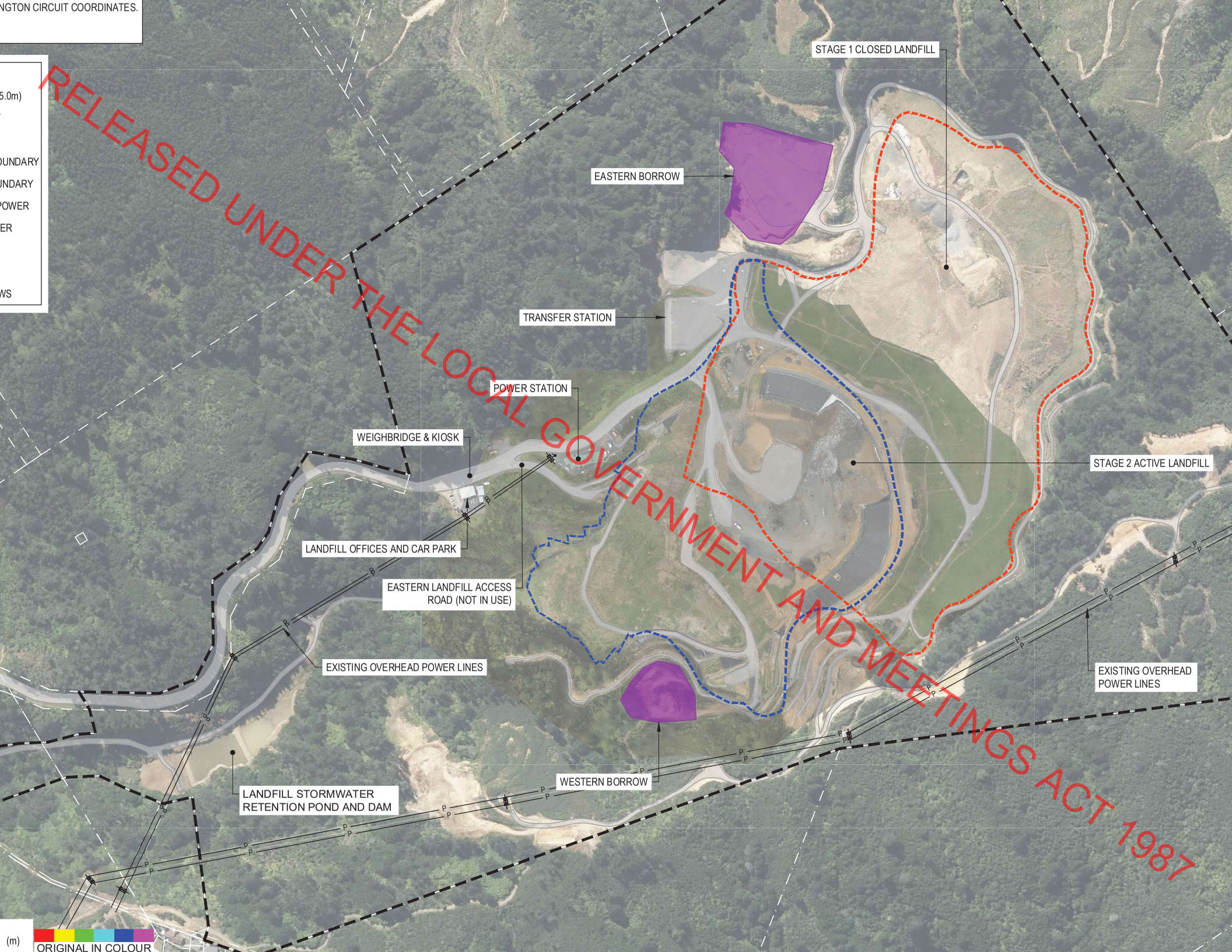

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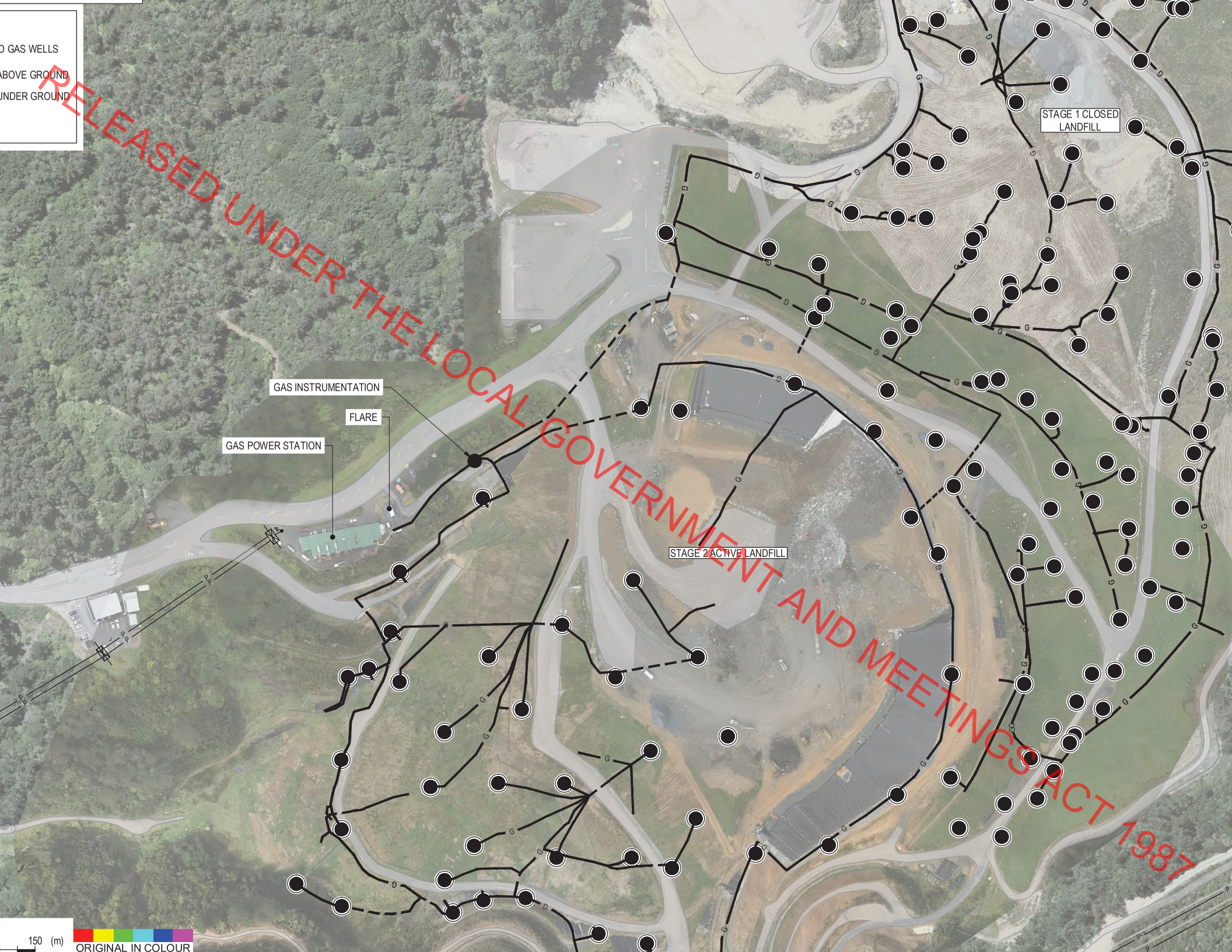

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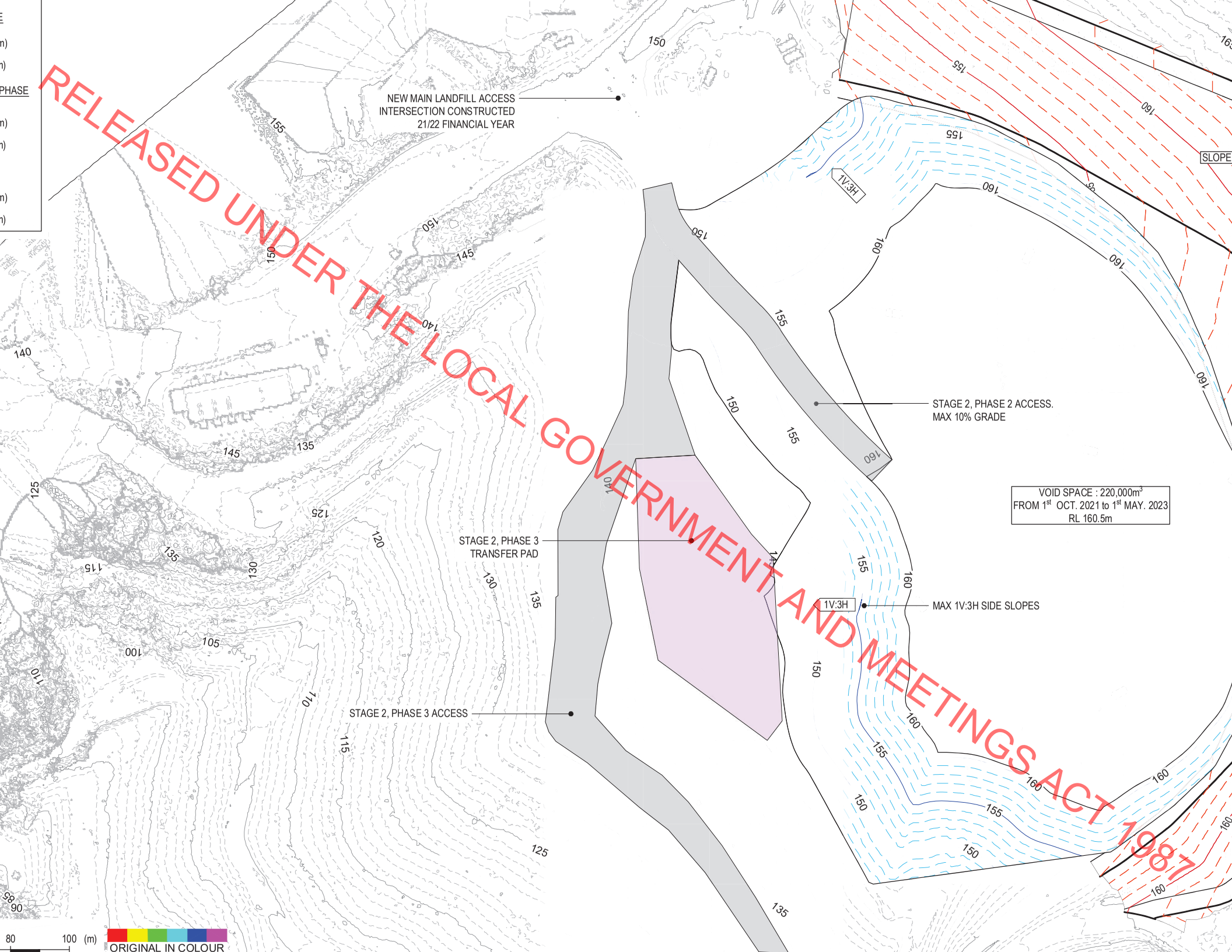

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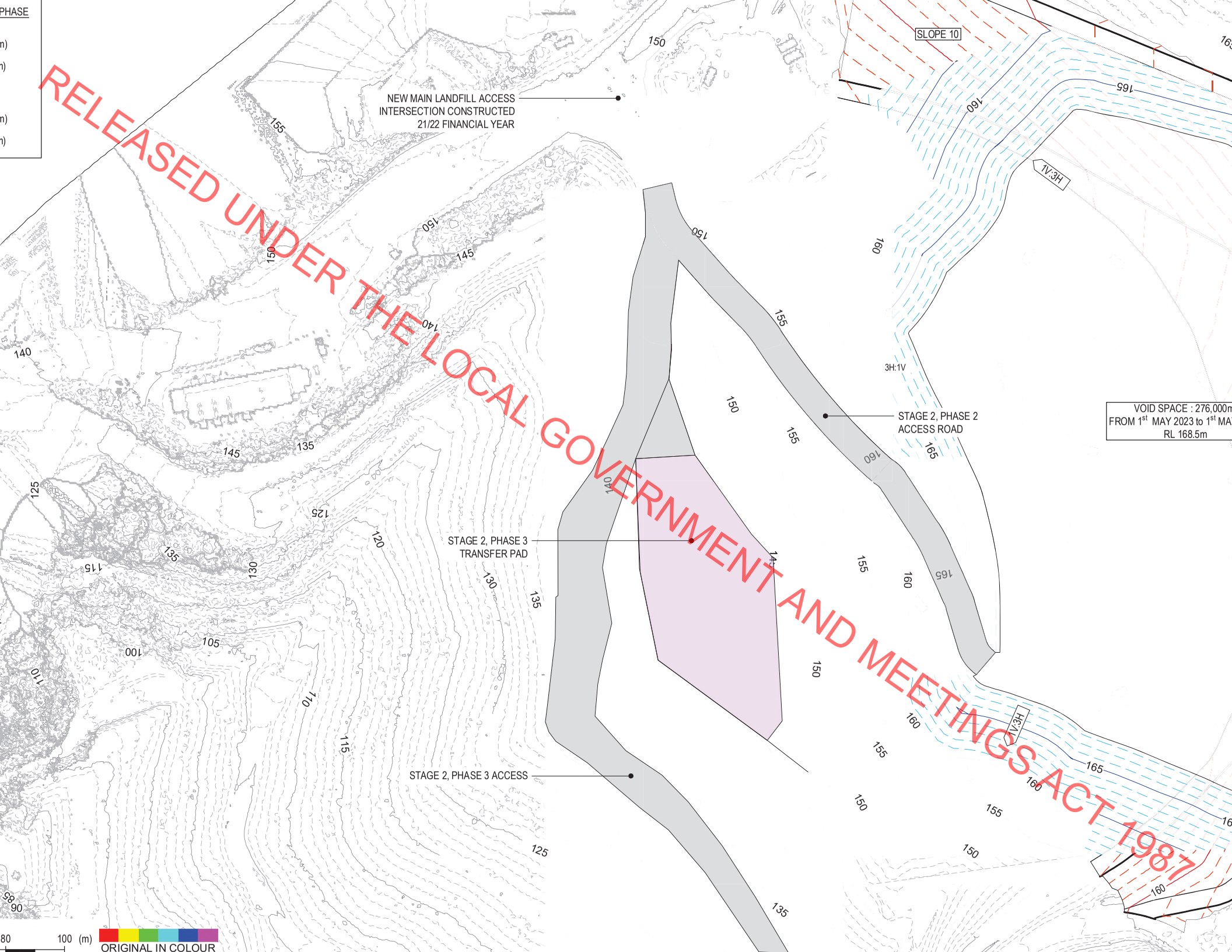

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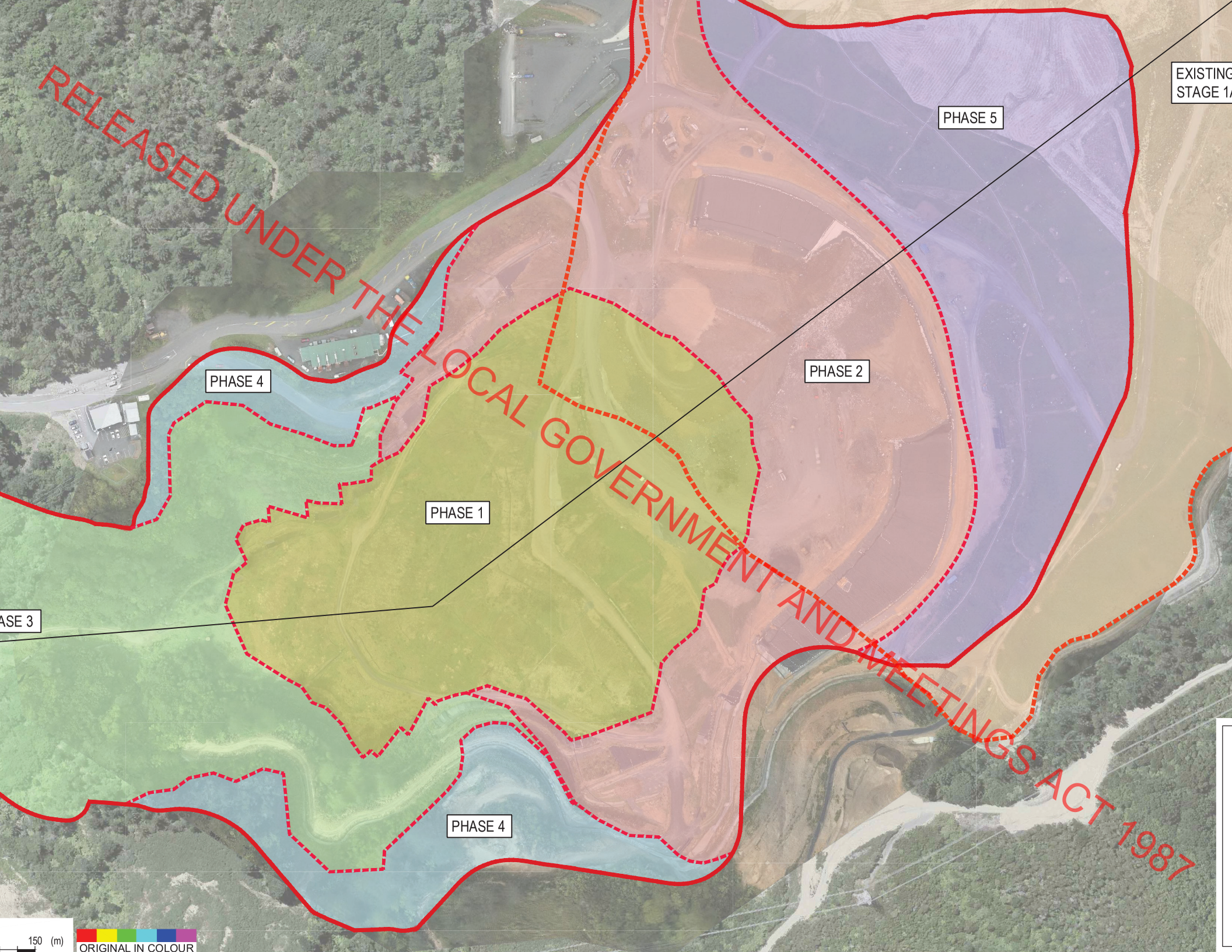

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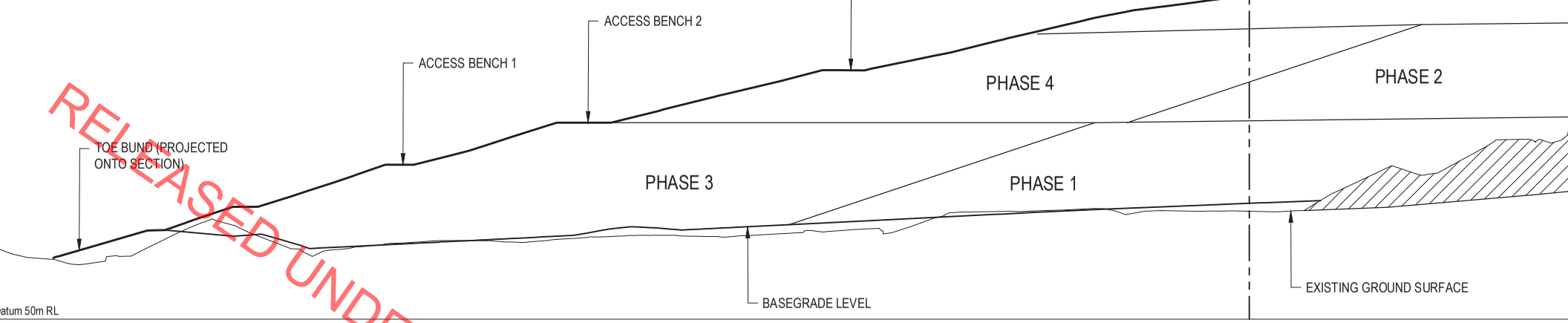
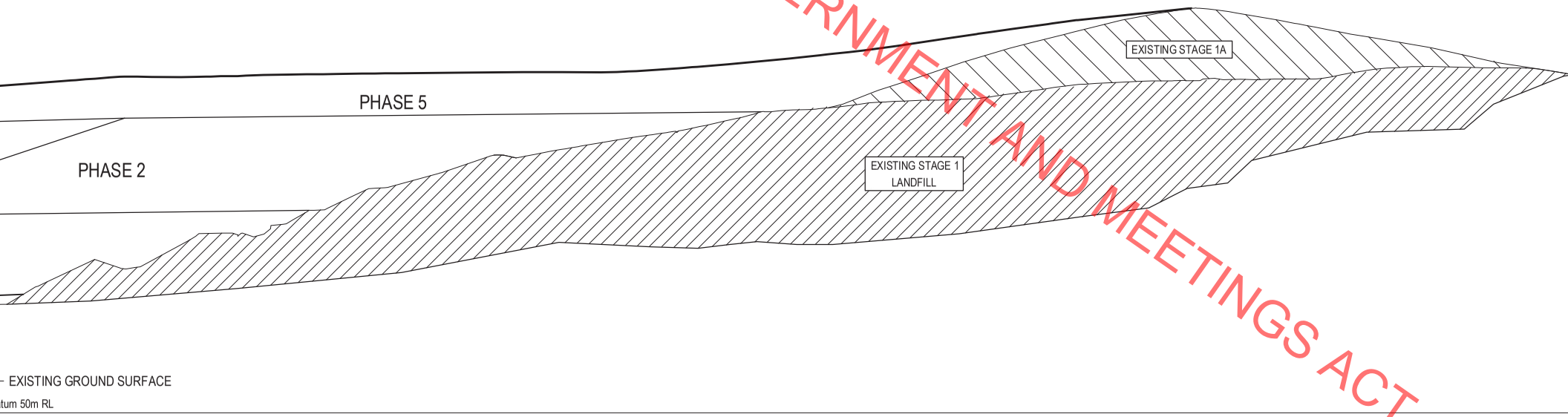


SECTION 1 LONG SECTION
SCALE 1: 2000 022 TO BE CONTINUED



SECTION 1 LONG SECTION
SCALE 1: 2000 022 CONTINUED

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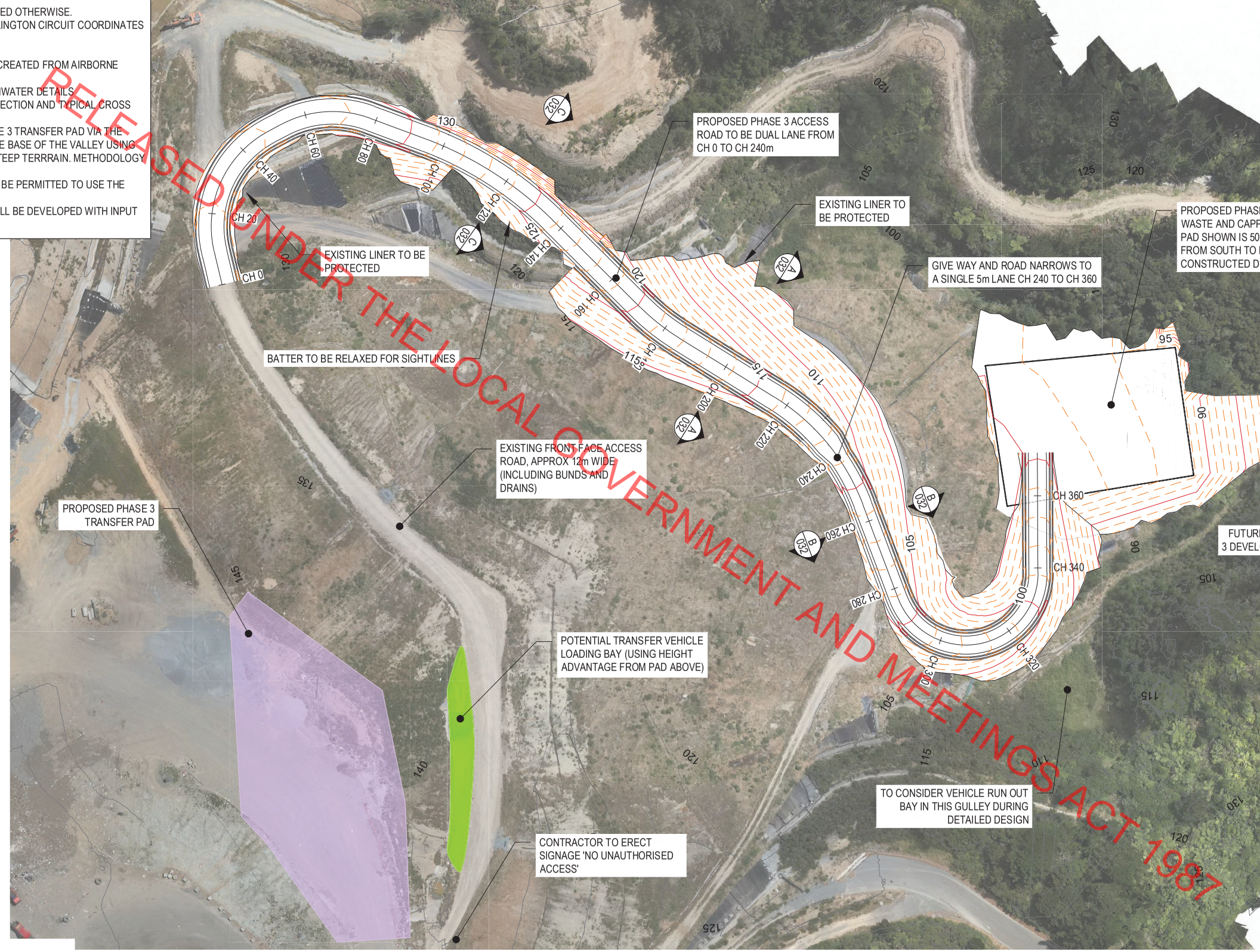
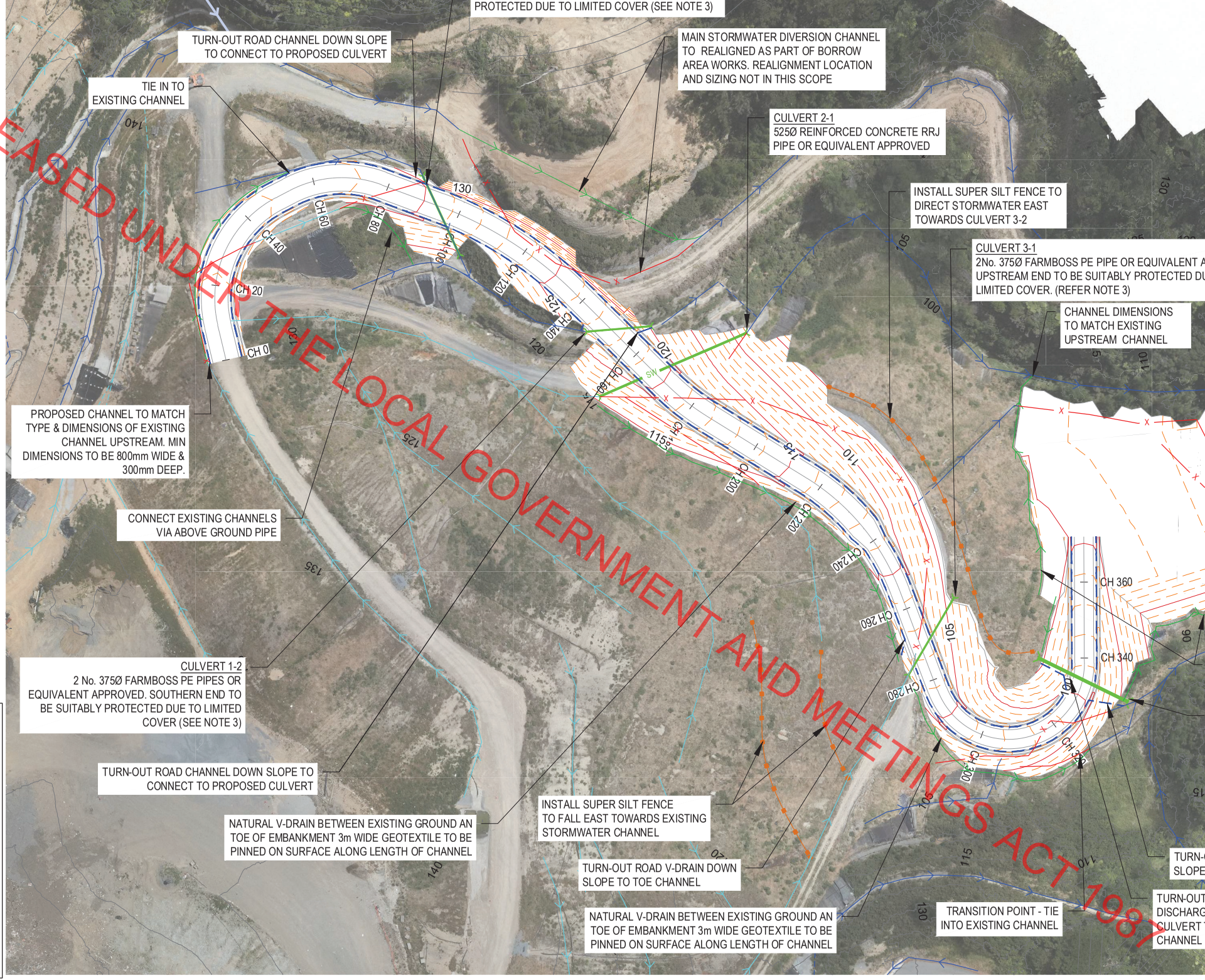

ED OTHERWISE.
INGTON CIRCUIT COORDINATES
CREATED FROM AIRBORNE
WATER DETAILS
ECTION AND TYPICAL CROSS
E 3 TRANSFER PAD VIA THE
E BASE OF THE VALLEY USING
TEEP TERRRAIN. METHODOLOGY
BE PERMITTED TO USE THE
LL BE DEVELOPED WITH INPUT
RELEASED UNDER THE LOCAL GOVERNMENT AND MEETINGS ACT 1987
PROPOSED PHASE 3 ACCESS ROAD TO BE DUAL LANE FROM CH 0 TO CH 240m
EXISTING LINER TO BE PROTECTED
EXISTING LINER TO BE PROTECTED
GIVE WAY AND ROAD NARROWS TO A SINGLE 5m LANE CH 240 TO CH 360
PROPOSED PHASE WASTE AND CAPP PAD SHOWN IS 50 FROM SOUTH TO CONSTRUCTED D
BATTER TO BE RELAXED FOR SIGHTLINES
EXISTING FRONT FACE ACCESS ROAD, APPROX 12m WIDE (INCLUDING BUNDS AND DRAINS)
PROPOSED PHASE 3 TRANSFER PAD
POTENTIAL TRANSFER VEHICLE LOADING BAY (USING HEIGHT ADVANTAGE FROM PAD ABOVE)
CONTRACTOR TO ERECT SIGNAGE 'NO UNAUTHORISED ACCESS'
TO CONSIDER VEHICLE RUN OUT BAY IN THIS GULLEY DURING DETAILED DESIGN
FUTUR 3 DEVEL
CH 0
CH 20
CH 40
CH 60
CH 80
CH 100
CH 120
CH 140
CH 160
CH 180
CH 200
CH 220
CH 240
CH 260
CH 280
CH 300
CH 320
CH 340
CH 360
C 032
A 032
B 032
75 (m)



STORMWATER
DE 200mm DEEP)
NCE
(5m INTERVAL)
MOVED
NT FACE DRAIN
M PERIMETER DRAIN

OTED OTHERWISE.
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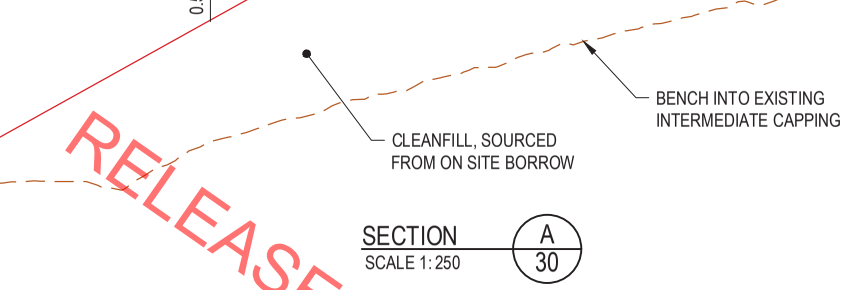
750MM WIDE AND 200MM
OCATIONS UNDER ROAD
TION TO BE IN
ALL CULVERTS.
E HEADWALLS AND
SLANTED DEBRIS
T.
N SLOPE TO BE LINED
ROSION PROTECTION AT

75 (m)
ORIGINAL IN COLOUR



SECTION A
SCALE 1:250
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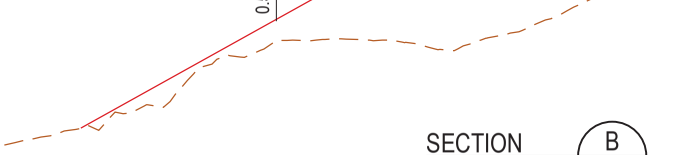

SECTION B
SCALE 1:250
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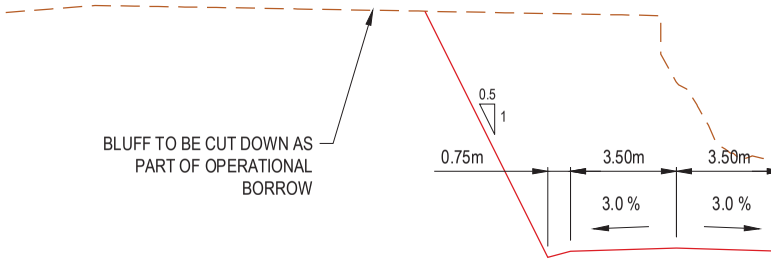

SECTION C
SCALE 1:250
30

n)	133.95	133.14	132.32	131.51	130.7	130.37	128.78	126.28	123.78	121.28	118.78	116.28	113.78	111.28	108.78	106.28	103.78	101.28	
(m)	133.79	132.26	131.8	132.81	129.42	129.7	132.16	130.23	127.81	115.84	111.16	111.26	110.48	109.38	106.55	104.85	99.95	95.41	
	0.00	20.00	40.00	60.00	80.00	86.88	100.00	120.00	140.00	160.00	180.00	200.00	220.00	240.00	260.00	280.00	300.00	320.00	
	-4.06%				LVC=5									-12.5%					
RY	Tangent Length=9.4m	Rad=30	Tangent Length=4.1m	Rad=30	Tangent Length=16.1m	Rad=100	Tangent Length=34.2m	Rad=-59.479	Tangent Length=31.2m	Rad=60	Tangent Length=27.8m	Rad=-20							
	Arc Length=39.7m		Arc Length=25.1m		Arc Length=42.5m		Arc Length=13.5m		Arc Length=39.3m		Arc Length=55.7m								

PHASE 3 ACCESS LONGITUDINAL SECTION

Horizontal Scale 1:1250
Vertical Scale 1:1250

75 (m)

ORIGINAL IN COLOUR

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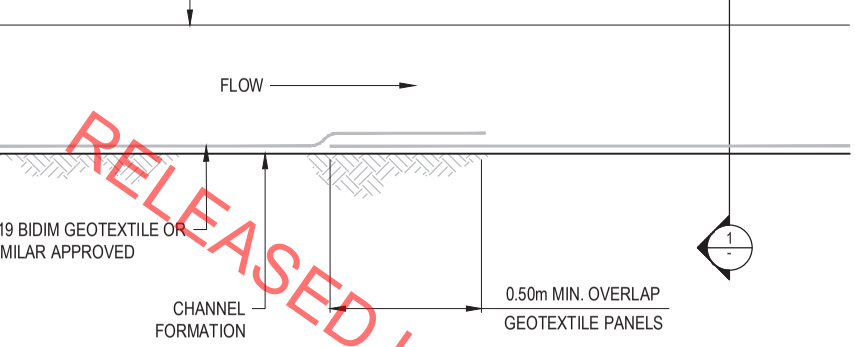
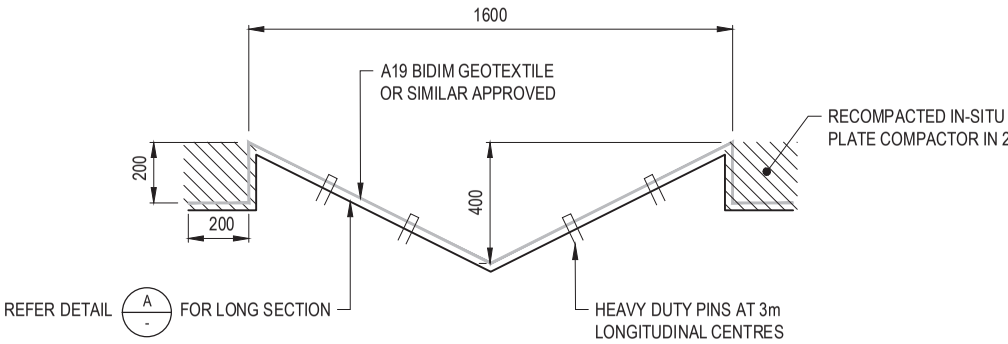
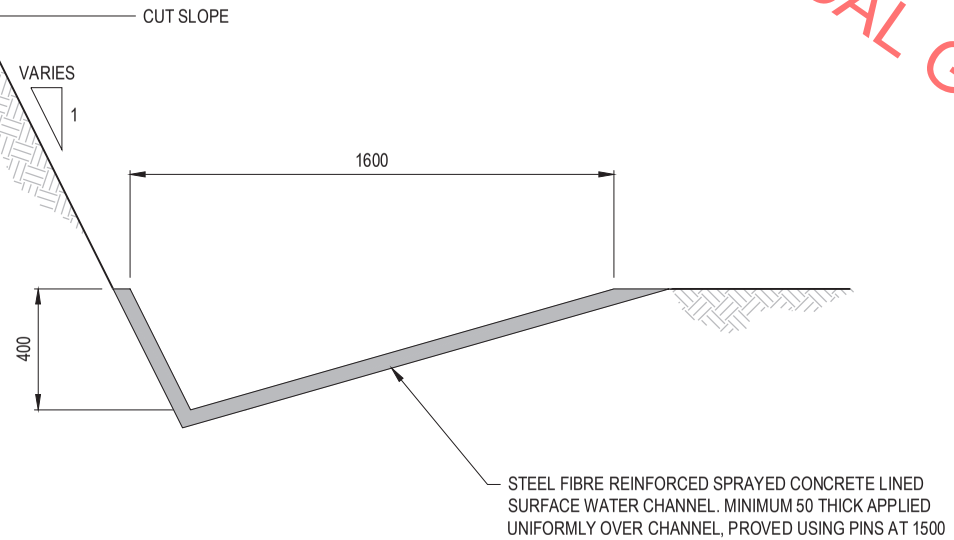


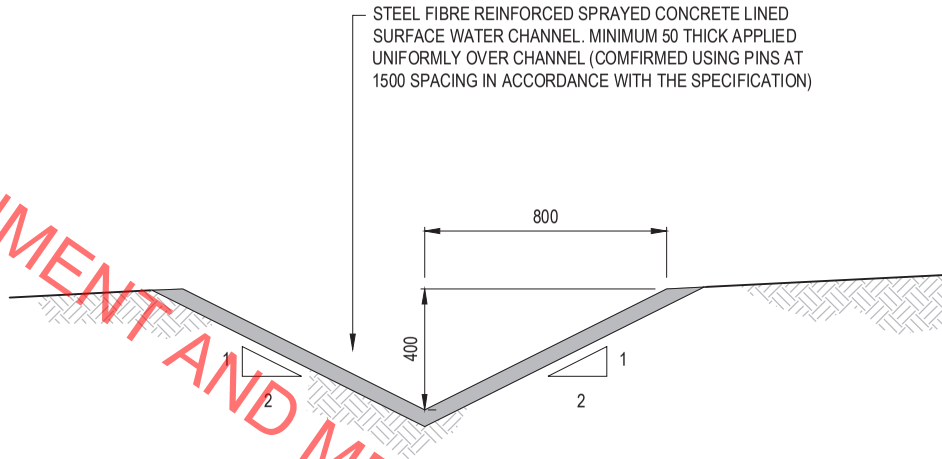
DETAIL A - TEMPORARY STORMWATER DRAIN LONG SECTION
SCALE 1: 25



SECTION 1 - TEMPORARY STORMWATER DRAIN
SCALE 1: 25



DETAIL B - TOE OF SLOPE SURFACE WATER DRAIN ON CUT SLOPES PERMANENT
SCALE 1: 25



DETAIL C - PLATFORM SURFACE WATER DRAIN ON FILL SLOPE PERMANENT
SCALE 1: 25

1.5 (m)

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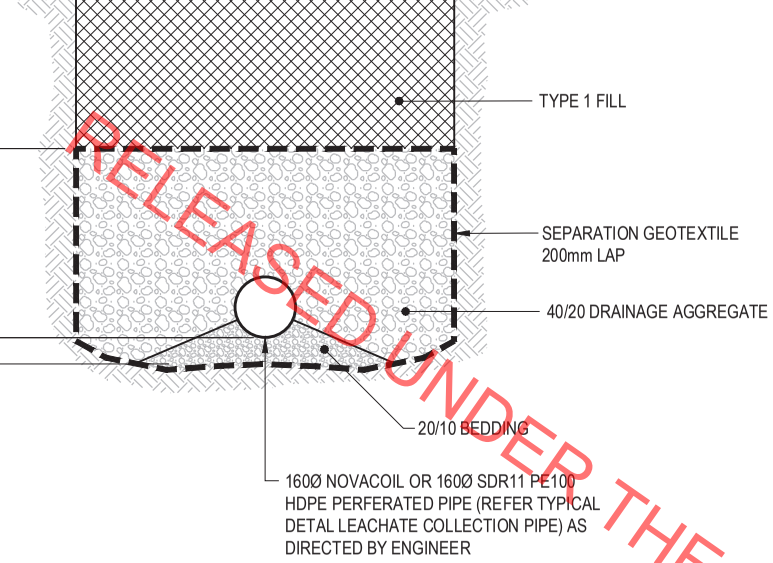
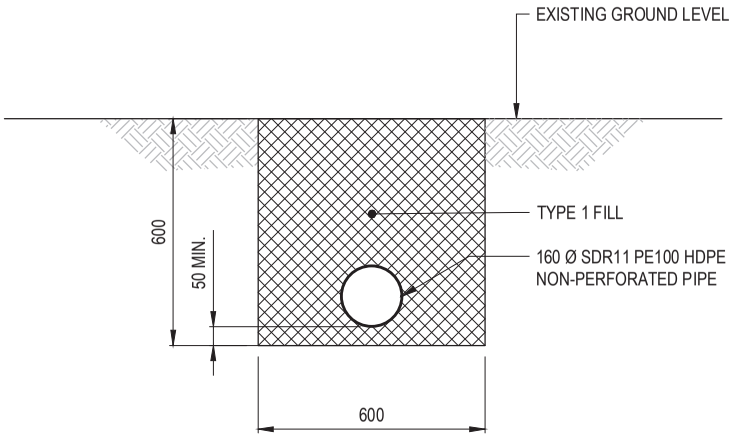
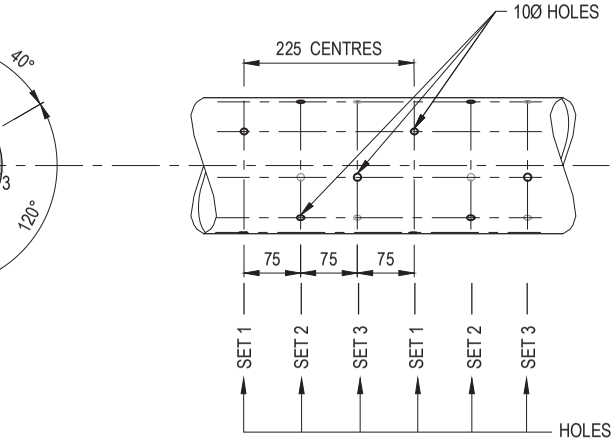


DETAIL D LEACHATE COLLECTION DRAIN
SCALE 1: 20 - TYPICAL SECTION



DETAIL E LEACHATE CONVEYANCE DRAIN
SCALE 1: 20 - NON-PERFORATED PIPE



DETAIL F LEACHATE COLLECTION PIPE
SCALE 1: 10 -

(m)

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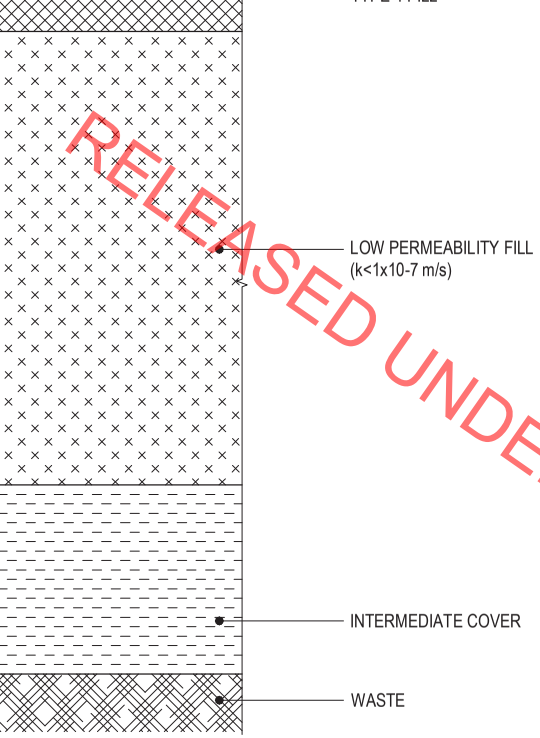
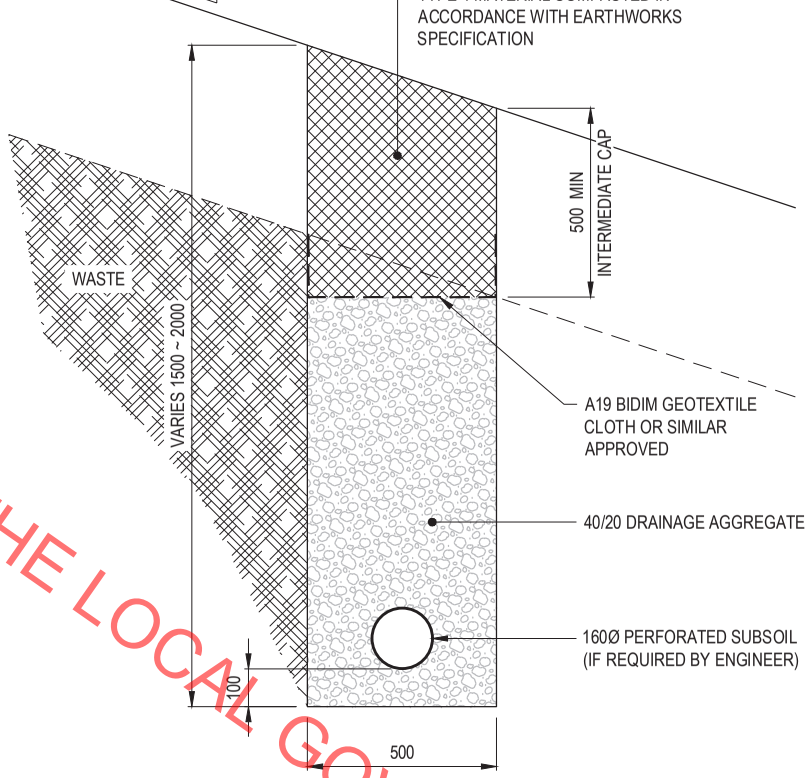
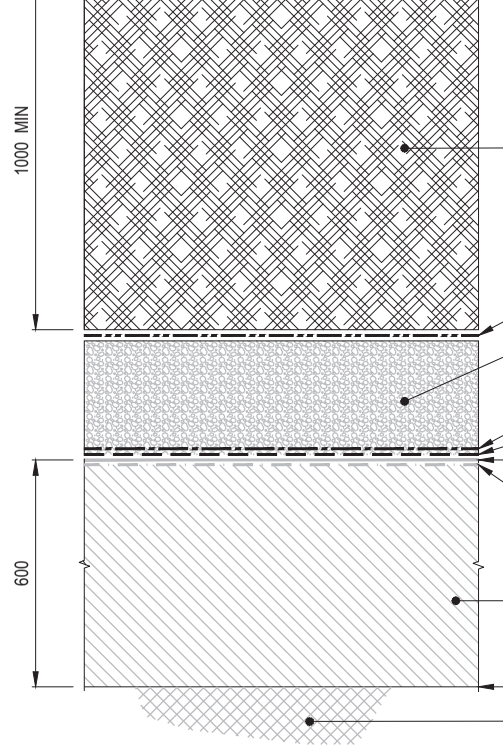
RELEASED UNDER THE LOCAL GOVERNMENT AND MEETINGS ACT 1987



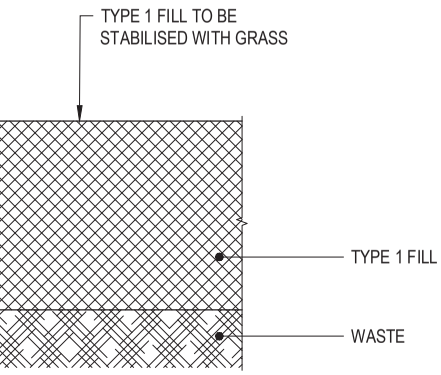
G FINAL COVER
-



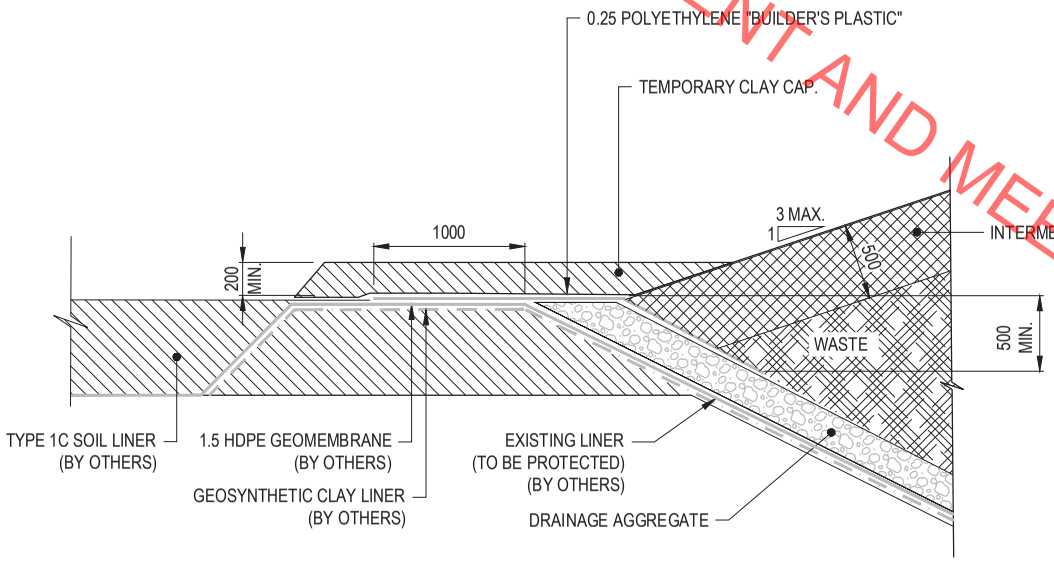
DETAIL SCALE 1: 20 — H - TYPICAL LEACHATE DRAIN REPAIR IN INTERMEDIATE CAPPING



DETAIL SCALE 1: 20 — J - LINER PROTECTION A



K - INTERMEDIATE COVER



DETAIL SCALE 1: 50 — L - TEMPORARY GAS INHIBITOR (TYPICAL)

NOTES:
1. ALL DIMEN
2. ALL MEAS
REQUIRED

(m)

CONTRACT DOCUMENT

VOLUME 2

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HUTT CITY
TE AWA KAIRANGI

Silverstream Landfill Operations Contract

Contract AD22 -2102

Prepared for
Hutt City Council | Te Awa Kairangi
Prepared by
Tonkin & Taylor Ltd
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1 This Opportunity in a Nutshell

1.1 What we need

Hutt City Council (HCC) is seeking an experienced and motivated partner to operate the Silverstream Landfill, and, as a Separable Portion, the associated Transfer Station and limited Resource Recovery activities with services commencing in February 2023. The transfer station operations / interim resource recovery facility will initially be provided from Silverstream Landfill for several years under this contract. We are also developing proposals to establish a comprehensive Resource Recovery Park catering to both domestic and commercial customers, either at Silverstream or at an alternative site. Council may progress this development with the partner selected through this procurement process or through a new procurement process once Council has determined the preferred approach.

1.2 What we don't want

We do not want to hear from entities that cannot support and deliver on HCC's carbon reduction objectives, or are not suitably experienced in running landfill and resource recovery operations of a similar size.

1.3 What's important to us

Our community has indicated that environmental sustainability, particularly waste minimisation and carbon reduction, is a top priority, and our Carbon Reduction and Resilience Plan 2021-31, Waste Management and Minimisation Plan 2017 – 2023, and Long Term Plan (LTP) 2021-31 set out what we are doing and intend to do. The LTP priorities of "investing in infrastructure" and "caring for and protecting our environment" are of particular relevance to this opportunity. The improvement of infrastructure to support resource recovery, and the decarbonisation of the services associated with operating the landfill, aligns with Council's waste reduction and climate change commitments.

Operating as a local authority, it is essential we are optimising public value from our contracts. This is more than simply cost and upholding high health and safety standards. We are interested in a high quality of service for landfill operation and delivering on Council's priorities, including the minimisation of waste and the reduction of emissions associated with the services to operate the landfill by 50% by 2030.

2.1 Invitation to Tender

2.1.1 Purpose

The purpose of this invitation (the ***Invitation***) is for Hutt City Council (the ***Principal***) to select a contractor for the Silverstream Landfill (the ***Project***).

The Principal's required form of contract is based on NZS 3917:2013 with the Principal's special conditions and is disclosed as part of this Invitation (the ***Contract***).

A contract will not come into force and effect until the Principal awards a contract, which it may choose to do or not to do at its sole and absolute discretion.

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2.1.2 Scope of the works

A summary of the scope of the works for the Contract is set out in the Specification (the ***Specification***), and the Contract Works are as defined in the Contract.

2.1.3 Tender Documents

The Tender Documents comprise the following:

(a) this document;

(b) the Contract;

(c) the Specifications for the Project, as provided as part of this Invitation; and

(d) any other documentation provided as part of this Invitation.

2.1.4 Principal's Representative

All communications with the Principal concerning this Invitation must be in writing and be made to the following contact person or such other person who may be appointed by the Principal from time to time (such person being the ***Principal's Representative***):

Name: s7(2)(a) [redacted]

Position: Project Manager and Senior Civil Engineer

Email: s7(2)(b)[redacted]@tonkintaylor.co.nz
(ii)

Telephone: s7(2)(a) [redacted]

2.1.5 Form of Tender

Tenderers are requested to submit the duly completed and/or signed Attachments as set out in Clause 120, including all details required by those Attachments.

2.1.6 Submission of Tender and irrevocability

Tenderers should submit their Tender in the following format:

(a) Electronic tenders

Electronic tenders will only be accepted if they are submitted via the GETS website (www.gets.govt.nz) before the closing time for the submissions, in the form prescribed by GETS and meet all other requirements of the Conditions of Tendering and Schedule to Conditions of Tendering.

Each tender shall be submitted as follows:

Submission 1: non-price information

- As defined in the Schedule to Conditions of Tendering

Submission 1 is to be endorsed with:

- The tenderer's name, "Non-priced attributes and other information"

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Submission 2: price information

- As defined in the Schedule to Conditions of Tendering

Submission 2 is to be endorsed with:

- The tenderer's name, " Price information"

The Tender should be submitted on or before the Tender Closing Date and time (defined below) late Tenders shall not be considered.

Facsimile tenders will not be accepted.

The Tender is irrevocable and may not, without the Principal's prior written consent, be withdrawn or amended by the Tenderer before the expiry of the Validity Period (defined below).

2.1.7 Tender Closing Date

The closing date for the submission of Tenders is **4pm, 20 May 2022** (the ***Tender Closing Date***).

2.1.8 Validity Period

The validity period expires at 4.00 pm on the date that is 90 days after (and excluding) the Tender Closing Date (the ***Validity Period***).

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2.2 Conditions of Tendering

In consideration of the Principal agreeing to consider the Tenders, the Tenderers agree to be bound by the Conditions of Tendering set out below, which replace the Conditions of Tendering of NZS 3917:2013 (the ***Conditions of Tendering***).

101 INTERPRETATION

101.1 The provisions of Section 1 of NZS 3917:2013 (as amended by any Special Conditions) shall apply to these Conditions of Tendering.

102 ISSUE OF DOCUMENTS AND COMMUNICATIONS DURING TENDER PROCESS

102.1 Tender Documents issued to prospective Tenderers remain the property of the Principal.

102.2 The Principal's Representative is named in clause 2.1.4 of the Invitation to Tender and in the Schedule to Conditions of Tendering.

102.3 The Principal's Representative is the only person authorised to receive queries, requests for information or other communications by Tenderers or related parties regarding this Tender. The Principal will not be bound by any statement, written or verbal, made by any person including the Principal's Representative unless that statement is subsequently expressly incorporated in the Contract.

102.4 Tenderers are requested to acknowledge receipt of the Tender Documents by completing and returning the Tender Acknowledgment Form included as **Attachment A** and returning it to the Principal's Representative within 2 weeks from the date of issue of the request for tender.

103 TENDERERS TO INFORM THEMSELVES

103.1 Any information provided by the Principal to Tenderers including Site information, has been provided to assist Tenderers in preparing Tenders and in carrying out the Contract Works. The Principal does not represent or warrant the completeness or accuracy of such information. Tenderers shall rely on all information provided by the Principal at their own risk and are responsible for the interpretation of the information.

103.2 The Schedule to Conditions of Tendering shall detail if an appointment is required to inspect the Site and if a Site inspection is mandatory. Where a Site inspection is mandatory it must be attended before submission of Tenders. This mandatory Site inspection must be attended in the presence of the Principal's nominated representative.

103.3 Each Tenderer shall be deemed to have:

(a) Inspected the Site, including surroundings, buildings, structures and services;
(b) Examined carefully and acquired actual knowledge of the contents of the Tender Documents and any other information supplied in writing;
(c) Undertaken all reasonable and practicable investigations and measurements;
(d) Familiarised itself with the requirements of all relevant authorities;
(e) Made its own inquiries, investigations and assessment of all risks and contingencies having an effect on the Tender; and

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(f) Satisfied itself as far as is practicable for an experienced contractor before tendering as to the correctness and sufficiency of its Tender for the Contract Works and of the prices stated in its Tender (inclusive of Pre-Agreed Subcontractors).

103.4 The tendered rates and prices shall, except where otherwise provided, allow for all the Contractor's obligations under the Contract as set out in the Tender Documents.

104 AMBIGUITIES IN TENDER DOCUMENTS

104.1 Where the Tender Documents are ambiguous or unclear to a Tenderer, it may request the issue of an explanatory notice. If an explanatory notice is issued, it shall be sent to all Tenderers and shall upon issue become part of the Tender Documents. Requests for information or clarifications that relate solely to the Tenderer's Tender will be provided to the Tenderer requesting the information for clarification only.

104.2 In the absence of an explanatory notice, Tenders may be submitted subject to any reasonable interpretation of any ambiguity or uncertainty in the Tender Documents. Any such interpretation and any assumptions made must be detailed in the in the Statement of Departures in the form included at **Attachment D**.

105 CONFIDENTIALITY

105.1 The information supplied by the Principal (either itself or through its consultants, agents or advisors) in connection with this Invitation, or any contract that arises out of it, is confidential. Tenderers should not release or disclose any of the information to any other person, (other than their employees or advisors), without the prior written consent of the Principal. Any publicity also requires the Principal's prior written consent.

105.2 The Principal may, at its sole and absolute discretion, require any Tenderer to sign a confidentiality deed, before releasing any confidential or commercially sensitive information to the Tenderer. The Tenderer agrees to sign the confidentiality deed, if required to do so.

106 ALTERNATIVE, TAGGED AND OTHER NON-CONFORMING TENDERS

106.1 The Principal reserves the right to consider any alternative tenders which fulfil the Principal's requirements. Alternative tenders shall be submitted as a separate tender clearly identified as an alternative tender. Tenderers may be requested during the Tender evaluation period to submit additional information to facilitate evaluation of the alternative.

106.2 Tenders submitted subject to tags, conditions or endorsement may be considered as alternative or non-conforming tenders. In respect of any alternatives, tags, qualifications, endorsements and other non-conformities (collectively **Non Conformities**), the Principal may at its sole and absolute discretion:

(a) evaluate or reject such Tenders;

(b) assign a price to any Non Conformity;

(c) request the Tenderer to withdraw any Non Conformity without any adjustment to the tender

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price; or

(d) request the Tenderer to withdraw any Non Conformity with adjustment of any relevant tender rates and prices provided that the adjustment is for an amount that would have been reasonably expected if the tender had been submitted without that Non Conformity.

106.3 All Non Conformities must be outlined in the Statement of Departures (**Attachment D**) and included with the Tender.

106.4 The Principal will not be bound by any Non Conformity unless such Non Conformity has:

(a) been outlined in **Attachment D** – Statement of Departures included with the Tender; and

(e) been expressly agreed by the Principal and incorporated into the Contract other than the Contractor's Tender.

107 SUBMISSION OF TENDERS

107.1 The Tender Closing Date is stated in the Schedule to Conditions of Tendering and each Tender shall be enclosed in a sealed envelope, or where provided in the Schedule to Conditions of Tendering submitted in an electronic form as described in the Schedule to Conditions of Tendering. Each Tender shall be identified as a tender for the particular contract and addressed as required by the Schedule to Conditions of Tendering.

107.2 Tenders shall be delivered to the address stated in the Schedule to Conditions of Tendering before the Tender Closing Date. If the Tender arrives after the latest date and time required for submissions, it may be considered as invalid. However, the Principal reserves the right to extend the period allowed for the submission of the Tender, at its sole and absolute discretion. Any late Tender in respect of which the Principal chooses not to exercise its discretion shall be returned to the Tenderer unopened.

107.3 Tenders sent by post or courier must be sent in time so that they may be placed in the tender box before the Tender Closing Date. While every care will be taken to place postal Tenders in the tender box, the Principal has no responsibility for failure to do so before the Tender Closing Date.

107.4 Tenders shall be prepared in the form and include all of the information required by the Schedule to Conditions of Tendering and shall include any rates or percentages required to be nominated in the Schedule to Conditions of Tendering.

107.5 The Tender shall be signed by the Tenderer.

107.6 The Cost of preparing and submitting a Tender shall be borne by the Tenderer.

107.7 If the Tender contains any error in extension of unit rates or in summation of items such as to vary the tendered rates and prices, and the Principal or its agent becomes aware of the error prior to acceptance of any tender, then the Principal shall draw the error to the attention of the Tenderer whose Tender contains the error. The Principal shall invite the Tenderer to confirm that its Tender remains open for acceptance at the tendered rates and prices notwithstanding the error. Unless the Tenderer so confirms its Tender it shall be deemed to be withdrawn. However, the Principal, at

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its sole and absolute discretion, shall have the right to permit the correction by the Tenderer of the error.

107.8 The Tenderer shall include rates and prices for all items of work described in the Schedule of Prices. Items against which no rate or price is entered by the Tenderer will not be paid for by the Principal when the Contract is executed and shall be deemed covered by other rates and prices in the Schedule of Prices.

107.9 Unless otherwise provided in the Schedule to Conditions of Tendering, the rates included in the Schedule of Prices shall be deemed to be fully inclusive of all allowances for On-site Overheads and for Off-site Overheads and Profit.

107.10 The Tenderer warrants that:

(a) all information provided by the Tenderer is complete and accurate in all material respects, and

(b) the provision of information to the Principal, and the use of it by the Principal for the evaluation of tenders and for the negotiation of any resulting contractual agreement, will not breach any third party intellectual property rights.

107.11 Notwithstanding the foregoing, the Principal shall be under no obligation to check the Tenderer's documents and shall not be liable under any circumstances in the event that an error is not discovered or an error that is discovered is not brought to the attention of the Tenderer.

108 INFORMATION

108.1 The Principal reserves the right to make enquiries regarding the Tenderer and to consider relevant information obtained from any source in the evaluation of the Tender. The Principal may verify with any third party any information included in the Tender or disclosed to the Principal in connection with the Tender, including carrying out a credit check on the Tenderer.

108.2 The Principal is not obliged to contact referees provided by Tenderers and may seek further information on any issue from sources other than the referees provided. The Principal may also take into account knowledge of the Tenderer it already has.

108.3 If required in the Schedule to Conditions of Tendering a letter from a Bank registered in New Zealand agreeing to execute a Bond in the form and amount, and for the period required by the Conditions of Contract must be submitted with the Tender.

109 CONFLICT OF INTEREST

109.1 Tenderers must complete and submit the Conflict of Interest Declaration in the form set out in **Attachment J**. The Principal reserves the right to reject any Tender where the Principal becomes aware that the Tenderer has any undeclared conflict of interest.

110 ETHICS

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110.1 By submission of Tenders, Tenderers acknowledge that they have not and shall not engage in any practices that gives one party an improper advantage over another, and/or engage in any unfair and unethical practices, in particular any collusion, secret commissions or such other improper practices.

111 DUE DILIGENCE

111.1 As part of the tender process, the Principal, together with its professional advisors and/or consultants, may carry out due diligence investigations of any or all of the parties that submit a Tender. Such due diligence may include due diligence investigations of any ultimate parent company that a Tenderer has identified will provide a parent company guarantee in support of the Contractor's obligations under the Contract.

111.2 By submitting a Tender, a Tenderer consents to the Principal (and its professional advisors and consultants) carrying out all due diligence investigations of the Tenderer as may be required by the Principal, acting reasonably, and will promptly provide all information and answer all questions as may be required by the Principal, acting reasonably, in carrying out such investigations subject only to (i) confidentiality obligations owed to unrelated third parties (which if applicable, must be identified and, if then requested by the Principal, the Tenderer will take all reasonable steps to have such confidentiality waived to enable disclosure to the Principal) or (ii) the rules of any stock exchange on which the Tenderer or its parent company is listed (which, if applicable, must be identified).

111.3 By submitting a Tender each Tenderer expressly acknowledges and agrees that the Principal shall not have any obligation to enter into any agreement or arrangement with any Tenderer if the Principal is not satisfied, in its sole and absolute discretion, with the outcome of its due diligence investigations regarding that Tenderer.

112 PREFERRED TENDERER

112.1 If a Tenderer is selected as "preferred tenderer" then such selection does not constitute an acceptance by the Principal of the Tenderer's Tender, or imply or create any obligation on the Principal to award the Contract to that Tenderer.

112.2 The Principal may at any time without being liable to the preferred tenderer cease discussions with any preferred tenderer and not award the Contract to that party.

113 RIGHTS RESERVED BY THE PRINCIPAL

113.1 Notwithstanding any other provision in the Tender Documents, the Principal reserves the right at any time to, at its sole and absolute discretion:

(a) ask any or all Tenderers for further information, or to verify information, in relation to any aspect of a Tender. These requests will require prompt action and must be responded to in writing within two Working Days or the time specified in the request;

(b) not consider a Tender where clarifying information requested under (a) above is not provided within the applicable timeframe;

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(c) accept any Tender (and award the Contract to the relevant Tenderer) or reject all or any Tender(s);

(d) not accept the lowest priced or highest ranked or any Tender(s);

(e) consider, accept or reject any non-conforming Tender or alternative proposals in part or whole;

(f) suspend, cancel and/or modify in whole or in part the tender process at any time;

(g) re-invite Tender responses to the exclusion of some or all Tenderers;

(h) seek additional Tenders to the exclusion of some or all Tenderers;

(i) waive any Non Conformities, irregularities, informalities or non-compliance in or with the tender process;

(j) amend any timetable in the tender process;

(k) use any form of evaluation criteria it deems appropriate in the evaluation of Tenders and determine the weightings that it gives to such evaluation criteria;

(l) change in part or whole any evaluation criteria it deems appropriate in the evaluation of Tenders and/or change in part or in whole any weightings given to the evaluation criteria;

(m) amend these Conditions of Tendering, the Invitation, the Tender Documents and/or any associated documents, by the issue of a written notice;

(n) consult with the public and/or any other party interested in the delivery of the Project;

(o) not give any reason for the acceptance of a Tender (and the award of a Contract), the rejection of any Tender or the cancellation of this tender process;

(p) provide additional written information, during the tender process, for Tenderers to allow for in their Tender;

(q) notify all Tenderer(s) and offer any Tenderer(s) the opportunity to amend their Tender where, as a result of one or more Tenders received or for any other reason, the Principal decides to change the Project and/or the Contract;

(r) request any Tenderer to clarify and/or adjust aspects of its Tender;

(s) re-evaluate any Tender, where such Tender has been amended during the tender process in accordance with these Conditions of Tendering;

(t) negotiate concurrently with one or more Tenderer(s) pending acceptance of a Tender and award of the Contract;

(u) negotiate with any Tenderer to the exclusion of other Tenderers;

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(v) negotiate with any Tenderer(s), at any time before or after acceptance of a Tender, and upon any terms and conditions; or

(w) not enter into any agreement (including, without limitation, the Contract) in relation to the matters described in this Invitation.

Any changes to these Conditions of Tendering, the Invitation, the Tender Documents and/or any associated documents prior to the Tender Closing Date will be advertised to all Tenderers by the issue of a written notice to Tenderers or post Tender clarifications to selected Tenderers.

114 NOTIFICATION OF ACCEPTANCE OF TENDER

114.1 The successful Tenderer shall be notified in writing by the Principal or its agent, that its Tender has been accepted.

114.2 If no Tender has been accepted by the expiry of the Validity Period stated in clause 115.1 of the Schedule to Conditions of Tendering, each Tenderer shall be notified in writing by the Principal or its agent whether its Tender is or is not still under consideration.

114.3 Unsuccessful Tenderers shall be notified by the Principal or its agent within 10 Working Days of acceptance of the successful Tender.

114.4 Notification under this 114 will be made to the relevant address provided by the Tenderers in its Tender.

115 VALIDITY PERIOD

115.1 The Validity Period identified in the Schedule to Conditions of Tendering is calculated from the Tender Closing Date. The parties may agree to extend the Validity Period.

115.2 Once submitted a Tender is irrevocable and cannot be withdrawn or amended except with the Principal's prior written consent. All Tenders received by the Principal must remain open and valid for acceptance by the Principal until the expiry of the Validity Period.

116 NO OBLIGATIONS

116.1 This Invitation is based on common law and is an invitation to treat. Accordingly, the issuance of this Invitation (and any other information in relation to or in connection with this Invitation) does not constitute an offer by the Principal that is capable of acceptance by any Tenderer.

Each Tenderer, by submitting their Tender, acknowledges and agrees that:

(a) their Tender is an offer that the Principal may accept or negotiate in the manner contemplated in these Conditions of Tendering;

(b) any such negotiations do not and will not result in the Principal incurring any obligations or liability whatsoever to the Tenderer; and

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(c) no obligations or liability whatsoever will arise between the Principal and any Tenderer in relation to or in connection with this Invitation, including, without limitation, in relation to or in connection with the conduct, process or outcome of this tender process, except to the extent to which a Tenderer and the Principal have entered into a Contract to perform the Contract Works.

To the extent that, and notwithstanding the foregoing, the Principal is found to be liable to a Tenderer in relation to or in connection with this Invitation, on whatever basis, then the Principal's liability is, in all circumstances, capped at $1.00.

117 ERRORS AND OMISSIONS

While the Principal has made every effort to try and ensure that the information and any representations made or contained within the Tender Documents are correct, the Principal is not liable for any errors or omissions or reliance on the same.

118 TENDER EVALUATION

118.1 Subject to the provisions of these Conditions of Tendering, the intended method of Tender evaluation and weightings (where applicable) are as set out in the Schedule to Conditions of Tendering.

118.2 Each Tenderer shall submit with their Tender full details of the non-price attributes as described in the Schedule to Conditions of Tendering.

118.3 Not used.

118.4 Not used.

118.5 No part of any Tender that is opened or evaluated will be returned to the Tenderer.

118.6 TENDER OPENING

There will be no public opening of Tenders.

118.7 MEETINGS

The Principal may require a meeting with any Tenderer(s) after tender close. If required, all meetings will be carried out at the Principal's offices at Hutt City Council main office, 30 Laings Road, Hutt Central, Lower Hutt.

118.8 EVALUATION PROCESS: WEIGHTED ATTRIBUTES

Tenders shall be submitted in two separate submissions, 'non price attribute's and 'price' as defined in Clause 2.1.6 and the Schedule to Conditions of Tendering and in the form prescribed by GETS.

The initial tender evaluation shall be conducted in three stages, as follows:

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Stage 1

This stage shall involve evaluating Submission 1 (non price information) information only and assessing the tender against each of the pass/fail criteria and non-price attributes as set out in this tender request.

Each non-price attribute shall be graded a points basis, from 0 (completely inadequate) to 100 (excellent). Any tender that scores 35 or less on any single non-price attribute shall be excluded from further consideration. Subject to Clause 118.19, this stage shall be completed for all tenders before starting Stage 2.

Stage 2

This stage shall consist of evaluating Submission 2 (price) and converting the tender price to a grade using the following formula. Any provisional sums in tender prices shall be removed before calculating price grades. Prices of alternative tenders shall not be considered when determining the median conforming tender price.

$$\text{Grade} = 50 + 100 \times \frac{\text{(Median Conforming Tender Price - Tender Price)}}{\text{(Median Conforming Tender Price)}}$$

Price grade may be negative but shall not be greater than 100.

If the price is specified as a schedule of rates, the unit price shall first be converted into a lump sum by multiplying the unit price by the estimate of required inputs or intermediate outputs.

The Principal reserves the right to exclude any abnormally low bids from this determination.

Stage 3

This stage shall consist of multiplying the weight of each attribute as specified in 118.10 of these Tender Documents by the grade of that same attribute and then dividing by 100 to give an index for each attribute. The indices for each Tender shall then be summed to give an overall index for each Tender. The overall index shall be rounded to the nearest whole number.

118.9 TENDER RANKING

Tenders shall (subject to Clause 118.19) be ranked on the basis of their overall indices, with the Tender with the highest index ranked highest.

Where more than one Tender shares the top overall index, the top ranking Tender shall be whichever Tender has the lowest price.

118.10 ATTRIBUTES AND WEIGHTINGS

The attributes and their weightings are as follows:

Health and safety & environmental	Pass/Fail
Financial stability	Pass/Fail
Decarbonisation	Pass/Fail

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Health and safety	10%
Track record	20%
Relevant experience	15%
Decarbonisation	10%
Methodology	15%
Price	30%
Total	**100%**

The non price attribute evaluation criteria is provided in **Attachment C.**

118.11 PASS/FAIL - HEALTH AND SAFETY EVALUATION

The Principal reserves the right to evaluate any attribute involving an assessment of Tenderer health and safety credentials as 'fail' or 'unacceptable' where the Principal considers the Tenderer's health and safety credentials do not reach the minimum standard for a reasonably competent contractor. Any tender that is assessed as 'fail' or 'unacceptable' under this clause shall be excluded from further consideration.

The pass/fail evaluation for Health and Safety will be carried out on assessment of information provided in **Attachment F.**

118.12A PASS FAIL - FINANCIAL STABILITY EVALUATION

The Principal reserves the right to evaluate any attribute involving an assessment of Tenderer financial stability credentials as 'fail' or 'unacceptable' where the Principal considers the Tenderer's financial stability credentials do not reach the minimum standard for a reasonably competent contractor. Any tender that is assessed as 'fail' or 'unacceptable' under this clause shall be excluded from further consideration.

The pass/fail evaluation for Financial Stability will be carried out on assessment of information provided in **Attachment G.**

118.12B PASS FAIL - DECARBONISATION

The Principal reserves the right to evaluate any attribute involving an assessment of Tenderer decarbonisation credentials as 'fail' or 'unacceptable' where the Principal considers the Tenderer's decarbonisation credentials do not reach the minimum standard for a reasonably competent contractor. Any tender that is assessed as 'fail' or 'unacceptable' under this clause shall be excluded from further consideration.

The pass/fail evaluation for decarbonisation will be carried out on the basis that the Tenderer must have:

- A corporate carbon footprint (or evidence that work is under way to compile one).
- A sustainability strategy and/or plan or similar document that drives actions (or evidence that work is under way to compile one).

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118.13 EVALUATION OF ALTERNATIVE TENDERS

Alternative tenders shall be evaluated as follows, and after the evaluation of all non-alternative tenders has been completed.

Alternative tenders are required to be submitted in a separate envelope (but within the one overall envelope as set out in the Tender Schedule).

118.14 ALTERNATIVE TENDERS – WEIGHTED ATTRIBUTES

Alternative tenders shall be evaluated in stages as follows:

Stage 1
This stage involves assessing the alternative tender against the non-price attributes. Each non-price attribute shall be graded on a points basis, from 0 (completely inadequate) to 100 (excellent). Any alternative tender that scores 35 or less on any attribute shall be excluded from further consideration.

Stage 2
This stage shall consist of assessing the difference from the present value of the end result offered by the preferred non-alternative tender (that which scored the highest overall index) and the alternative tender. The alternative tender price shall then be adjusted by this amount. The adjusted price shall be converted to a grade using the formula in the evaluation methodology for non-alternative tenders, and the same median conforming tender price that was used when calculating a price grade for non-alternative tenders. (Note: The median is not revised to take account of alternative tender prices).

Stage 3
This stage shall consist of multiplying the weight of each attribute as specified in 118.10 of these Tender Documents by the grade of that same attribute and then dividing by 100 to give an index for each attribute. The indices for each alternative tender shall then be summed to give an overall index for each tender. The overall index shall be rounded to the nearest whole number.

118.15 ALTERNATIVE TENDER RANKING

Alternative tenders shall then be compared with the preferred non-alternative tender to determine the ranking of the alternative tender. The Principal shall not be bound to evaluate, accept (or shortlist) any alternative tender.

118.16 CHECKS AND PRIVACY ACT

Each Tenderer confirms to the Principal, on its own behalf and on behalf of any key personnel referred to in its tender, that the Principal is authorised to verify with any third person any information included in the tender or disclosed to the Principal in connection with the tender (whether that information relates to such key personnel or otherwise).

119 POST TENDER EVALUATION

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119.1 TENDER EVALUATION INFORMATION

(a) The Principal may, at its sole and absolute discretion, provide all Tenderers with the name of the successful Tenderer, the successful tender price, the range of tender prices, the range of each non-price attribute score and the Tenderer's own non-price attribute scores following the conclusion of the tender process and award of the contract. The Tenderers acknowledge that the foregoing information may be provided and consent to such provision.

(b) Notification shall not include disclosure of the details of the tenders or detail as to how the evaluation result was arrived at.

Where three or less tenders are received the Principal may elect to only provide the name of the successful Tenderer and the successful tender price.

119.2 POST EVALUATION DEBRIEF

Tenderers may request a post-evaluation debrief meeting with a representative of the Principal to discuss their tender submission. The Principal may accept or decline such request at its sole and absolute discretion. The purpose of such debrief is to provide helpful feedback on the Tenderer's tender to assist the Tenderer to improve subsequent tenders. Any such meeting will not cover details of competing tenders or the basis of specific scoring for any tender, will be informal, on a without prejudice basis and non minuted.

119.3 PREFERRED TENDER

For the avoidance of doubt, should the Principal advise any Tenderer that its Tender is the ''preferred tender' such advice does not:

(a) constitute an acceptance by the Principal of the Tenderer's Tender, nor create a contract;

(b) constitute an award of the contract to the Tenderer;

(c) imply or create any obligation on the Principal to enter onto or continue any negotiations with that Tenderer or to award the contract to that Tenderer; or

(d) negate or derogate from the Principal's right and obligation to award or not award the contract in accordance with the Tender Documents.

The Principal may discontinue any negotiations with a preferred Tenderer at any time.

120 TENDER ATTACHMENTS

The Tenderer must complete and submit with the Tender Attachments A to J (which are provided in Word) including all details required by those Attachments.

Attachment A	Tender Acknowledgment Form
Attachment B	Tender Form
Attachment C	Non-Price Attributes Evaluation Criteria
Attachment D	Statement of Departures Form

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Attachment E	Tenderers Business Details (including References and Banker's Details)
Attachment F	Health, Safety and Environmental Pre-Qualification Form
Attachment G	Financial Position Pre-Qualification Form
Attachment H	Key Personnel Listing Form
Attachment I	Insurance Information Form
Attachment J	Conflict of Interest Declaration Form

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2.3 Schedule to Conditions of Tendering

Clause numbers refer to the Conditions of Tendering.

Contract for:	Silverstream Landfill Operations Contract

Clause in Conditions of Tendering	Title and subject matter	Specific condition data (Expand cells if required)
102	Issue of documents	
102.2	Principal's Representative:	s7(2)(a) [redacted] s7(2)(a) [redacted] s7(2)(a) [redacted]@tonkintaylor.co.nz
103	Tenderers to inform themselves	
103.2	Is an appointment required to view the Site?	Yes
	If yes, the appointment details are:	Date and time are TBC by prior arrangement with the Principal's Representative.
103.2	Is mandatory Site inspection required?	Yes
	Safety equipment and access requirements for visiting the site are:	Hard hat Steel capped boots Wrist to ankle cover High viz vest
107	Submission of tenders	
107.1	The Tender Closing Date is:	**4pm, 20 May 2022**
	Are electronic Tenders acceptable?	Yes

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		(GETS, refer also 2.1.6)
	If yes, tenders will be acceptable in the following electronic form:	PDF or Word for tender documents Excel for the schedule of prices
107.2	Tenders must be delivered to:	N/A (online only using GETS)
107.4	The form of Tender	All Tenderers must advise Council of their intent to submit a tender by submitting the 'Tender Acknowledgement' in **Attachment A** no more than 2 weeks after the date of issue of the RFT. The information to be supplied with tenders is: • Provision of an electronic tender via GETs. • Submission of two electronic submissions to GETs as described below. • Submission 1 – Shall contain all non-price information (refer below). • Submission 2 – Shall contain all price information (refer below). • Each submission should clearly identify whether it is submission 1 or 2, refer also Cl 2.1.6. • Both submissions should be clearly labelled: ○ Tender for Contract No. AD22-2102: Silverstream Landfill Operations Contract'. ○ have the Tenderer's name clearly identified with the submission.
	The information required to be submitted with the Tender	• Tenderers shall complete the Tender Acknowledgement Form' **(Attachment A),** within 2 weeks of date of RFT. **Submission 1 - Non-Price information:** • Completed non price attribute information **(Attachment C).** • Cl 108.3 letter from Tenderers bank agreeing to execute bond over the contract term.

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		• Completed Statement of Departures Form **(Attachment D).** • Completed Tenderers Business Details Form **(Attachment E).** • Completed Health, Safety and Environmental Pre-Qualification Form **(Attachment F),** refer also Cl 118.11. • Completed Financial Position Pre-Qualification Form **(Attachment G)**, refer also Cl 118.12A. • Information required by Cl 118.12B regarding decarbonisation. • Completed Key Personnel Listing Form **(Attachment H).** • Completed Insurance Information Form **(Attachment I).** • Completed Conflict of Interest Declaration Form **(Attachment J).** **Submission 2 - Price information:** • Completed Tender Form **(Attachment B).** • Completed Schedule of Prices. • Any other price information.
107.9	Are the rates included in the Schedule of Prices fully inclusive of all allowances for On-site Overheads and for Off-site Overheads and Profit?	Yes
	If the rates in the Schedule of Prices are not fully inclusive, are percentages for On-site Overheads and Off-site Overheads and Profit required to be nominated in the tender?	N/A
	Is the percentage for processing of Variations required to be nominated in the tender?	No
	Are the percentages for On-site Overheads and for Off-site Overheads and Profit to be added to Net Cost for the Contract Works or	N/A

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	any Separable Portion in a cost reimbursement contract required to be nominated in the tender?	
108	Information	
108.2	Is a letter from a Bank registered in New Zealand agreeing to execute a Bond in the form and amount, and for the period required by the Conditions of Contract required?	Yes, refer Cl 108.3
115	Validity Period	
115.1	Validity Period of Tenders	90 days
118	Tender evaluation	
118.1	Subject to the Conditions of Tendering, Tenders will generally be evaluated using the:	General Criteria: • Pass/fail method and Comparative Criteria: • Weighted attribute method Detailed evaluation process is provided in Clause 118 and Attachment C.
(a)	**General Criteria:** Pass/fail at the Principal's sole and absolute discretion:	
	Being Tenderers' response to the following attachments: **Health and Safety - Attachment F** Health, Safety and Environmental Pre-Qualification Form **Financial Position - Attachment G** Financial Position Pre-Qualification Form **Decarbonisation - Cl 118.12B**	If the Principal assigns a fail to attachments F, G and/or Clause 118.12B, then that Tender may or may not be considered further by the Principal, at its sole and absolute discretion.
(b)	**Comparative Criteria**: Weightings will be applied as follows:	

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	Refer Cl 118 regarding evaluation and scoring procedures. Any tender that scores 35 or less on any single non-price attribute shall be excluded from further consideration.
• Health and Safety	10%
• Track record	20 %
• Relevant Experience	15%
• Decarbonisation	10%
• Methodology	15%
• Price	30%
Total	100%

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Attachment A – Tender Acknowledgement Form

This completed form must be emailed as a signed (scanned) PDF to the Principal's Representative named in the Schedule to Conditions of Tendering by no later than 2 weeks from the date of issue of the request for tender.

TENDER FOR:	**Silverstream Landfill Operations Contract**

Tenderer's acknowledgment

We acknowledge receipt of the Tender Documents dated ……

Please tick the applicable statement below:

☐ We will participate in this tender process

OR

☐ We will not participate in this tender process

We nominate the following person to communicate on our behalf in relation to the tender process and our Tender:

Name of Tenderer:	
Name of contact person:	
Position of contact person:	
Contact person's address:	
Contact person's telephone number:	
Contact person's email address:	
Signed by authorised signatory of the Tenderer:	
Name and title of authorised signatory:	
Date:	

The Principal will confirm by email that it has received your Tender Acknowledgement Form.

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Attachment B – Tender Form

TENDER FOR:	**Silverstream Landfill Operations Contract**

Tenderer's acknowledgment

1. Having examined the site and the Tender Documents for the above-named Contract Works, we offer to carry out the contract works and remedy defects in the whole of the said Contract Works in conformity with these Tender Documents for the sum of

   _____ ($_____)

   plus Goods and Services Tax or such other sums as may be ascertained in accordance with the Contract.

2. This sum includes full allowance for Notice(s) to Tenderers No(s):

   [*Insert]*

3. We undertake to complete and deliver the whole of the Contract Works comprised in the Tender Documents within the time stated in the Conditions of Contract, or such other time ascertained in accordance with the Tender Documents.

4. This Tender is valid for the Validity Period stated at clause 115.1 of the Schedule to Conditions of Tendering, calculated from the Tender Closing Date.

5. Until a Contract Agreement is prepared and executed, this Tender together with your written acceptance thereof, shall constitute a binding Contract between us as Contractor and Hutt City Council as Principal.

6. We understand that the Principal is not bound to accept the lowest priced, highest scoring or any Tender received.

7. We authorise the Principal to seek an opinion from our banker regarding our ability to undertake this Contract.

8. We understand that no legal or other obligations shall arise between the Tenderer and the Principal in relation to the conduct or outcome of the tender process unless and until that Tenderer has received written notification of the acceptance of its Tender.

9. We attach the information required to be submitted with this Tender and confirm that all such information is complete and accurate.

Name of Tenderer:	
Signed by authorised signatory of the Tenderer:	
Name and title of authorised signatory:	
Date:	

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Attachment C – Non-Price Attribute Evaluation Criteria

Criteria	Evaluation will be undertaken on the following requested information
Health and safety **(10%)**	**Please supply the following:** a) A copy of your corporate health and safety plan. b) The name of the person who co-ordinates health and safety in your company. c) An outline of your health and safety plan relevant to the carrying out of the Contract Works requested by this tender and the way in which your obligations under the Health and Safety at Work Act 2015 will be fulfilled. Your outline should cover: • The extent to which you will accept responsibility for those risks and to which the Tenderer expects other persons (including the Principal) to accept responsibility for those risks. • The way you will manage risks and health and safety obligations that will be your responsibility both as allocated under the Contract and under the Health and Safety at Work Act 2015. • The name and relevant qualifications/work experience of the person you propose to appoint for the purpose of ensuring compliance with all health and safety requirements. • Your personnel who have training in first aid and cardio-pulmonary resuscitation (CPR). • Your accident and incident reporting and recording procedure in relation to significant events affecting the health and/or safety of any person under the Tenderer's supervision. • Your emergency programme for the handling of emergencies or imminent danger arising while carrying out the Contract Works. d) A summary of your accident statistics for the last two years. Include: • Total Recordable Injury Frequency Rates (TRIFR) • Fatalities • Lost Time Injuries (LTI) • Medical Treatment Injuries (MTI) • First Aid Injuries (FAI) • No. of hours worked • No. of employees. e) Summary of your health and safety 'credentials' covering:

Criteria	Evaluation will be undertaken on the following requested information
	• awards received • prosecutions or complaints in the last five years • company safety certifications and memberships • other relevant information.
Track record (20%)	**Please provide the information below for at least three reference projects similar to the work covered by this RFT and the names/details of a referee for each project who is able and is authorised by you to comment effectively on the nature of the projects and your performance in relation to those projects.**

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Criteria	Evaluation will be undertaken on the following requested information
	Note this section should focus on your record of success (and failure) in the delivery of the reference projects to establish your credentials in project delivery. The focus is on the tendering organisation. **This section includes, but is not limited to, the following issues. You must as a minimum include a comment on each of the items listed and on any other issues in respect of this attribute that you consider are relevant. Please comment generally but also provide comment for each of your nominated reference projects.** a) Your record as to completion of projects: • on time • within budget • to specified performance targets. b) Whether you complied with (or exceeded expectations in relation to) appropriate management criteria including Management, Production, Health & Safety, Environmental Management, Public interface, Administration and Quality Management on similar contracts. c) Reacting to poor performance. d) Customer care record. e) Responsiveness and timeliness to client requests. f) Interacting with the public daily and/or project stakeholder groups. g) Management of environmental issues, including compliance with consent conditions. h) Major project risks, how these were managed and the parties involved in the risk management. i) Significant claims and/or disputes arising including how claim/disputes were managed and outcomes. Can you please provide comment on the following (can relate to reference or other projects): j) For a Strategic Partnership: • Success in utilising collaborative contract management mechanisms (e.g. partnering and associated agreements). • Working collaboratively with local authority clients and stakeholders on the delivery and continuous improvement of landfill operations. • Key business objectives for the Tenderer in the Wellington Region and how these will be achieved or supported through the strategic partnership. k) Achieving waste reduction and broader sustainability on similar operations including reducing energy use, low impact water management and emissions reductions.

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Criteria	Evaluation will be undertaken on the following requested information
	l) Introducing innovation to address cost and increasing the social, environmental and cultural benefits of similar operations. Note this section should focus on your record of success (and failure) in the delivery of the reference projects to establish your credentials in project delivery. The focus is on the tendering organisation.
Relevant experience (15)%	**Please provide the information below for at least three reference projects similar to the work covered by this RFT.** **Note this section should focus on the nature of the reference projects to establish the extent of your experience in similar projects. The focus is on the projects.** **Information is sought about the Tenderer's key staff for the contract and management systems that will be used to control the work being undertaken. Please comment generally but also provide comment (as appropriate) for each of your nominated reference projects.**

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Criteria	Evaluation will be undertaken on the following requested information
	a) **Complete Attachment H** 'Key personnel Listing Form', individuals background/expertise and % allocated to this contract. Key personnel shall include the following positions as a minimum plus any other key staff nominated by the Tenderer: • Contract Manager/Contractor's Representative • Landfill Manager • Site Supervisor/ Foreman • Quality Manager • Health and Safety Supervisor/Manager • Environmental Manager • Sustainability and Innovation Manager (Note that one person may hold multiple roles if appropriately qualified and trained. If one person is to hold multiple roles the Tenderer must provide evidence of training and competency). b) Experience with contracts for works similar in nature and similar size to the Contract Works under this RFT. c) Experience with work in the Wellington region and in particular to working in landfills in steep incised valleys. d) Health and safety experience (Please also complete health and safety section). e) The relevant experience and expertise of your key subcontractors in areas comparable with this project. f) Traffic control experience. g) Public contact experience. h) Experience in dealing with difficulties, emergency and contingency planning. i) Systems for innovation and continuous improvement including evidence of how these have been applied on other contracts. j) Consistently maintaining specified performance standards and the quality of data supplied in reporting (quality management systems), k) Experience with providing services to other businesses (including interfacing with other businesses, financial management (invoicing etc) and health and safety interaction), noting this Contract requires provision of the landfill as a service to other businesses on behalf of the Principal. Can you please provide comment on the following (can relate to reference or other projects): l) Examples of Strategic Partnerships (public or private sector) the involvement of key staff nominated in this project.

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Criteria	Evaluation will be undertaken on the following requested information
	m) The Tenderers approach to providing employment and training opportunities for youth and underemployed members of the Hutt Valley community in delivering the services.
Decarbonisation (10%)	**Councils requirement for this contract is that by 2030, the landfill operator will reduce carbon emissions associated with the landfill operation (within their control) by a minimum of 25%, with a desirable reduction target of 50% compared to the 2020/2021 base year.** **For purpose of this evaluation, the current estimate for the landfill operation Scope 1 emissions (Direct emissions from owned or controlled sources) and Scope 2 emissions (Indirect emissions) for the 2020/2021 Financial Year is 651 tonnes. Therefore, the maximum allowable annual operational emissions is 488 tonnes (preferably 326 tonnes) by 2030.** **Tenders shall clearly demonstrate the ability and commitment to achieving Councils decarbonisation target by providing:**

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Criteria	Evaluation will be undertaken on the following requested information
	a) Evidence of experience and a track record for decarbonising services, with a particular focus on electrification or decarbonisation of the fleet. This shall include but not be limited to: • The contact person within your organisation who will be responsible for decarbonisation for this project. Please provide details of relevant experience relating to decarbonising services for similar or other types of projects. • Ability to calculate the carbon footprint for similar or other types of projects. • Experience relating to the development of carbon reduction initiatives and strategies/plans for similar or other types of projects. • Reporting against carbon reduction targets. b) An outline plan on how to achieve a minimum 25% (50% desirable) reduction in carbon emissions for the Silverstream Landfill Operation by 2030. The plan shall include: • An indication of what changes will be made to achieve the target. • Provide a list of current technologies (i.e. plant and similar) to be used in the landfill operation, document expectations and the timeline to transition to low carbon alternatives and provide an indicative cost estimate (where possible). • An indicative timeline for those changes. c) Plans and ideas to further decarbonise operations within the life of the contract. **Note**: The Tenderer is expected to include in their price the proposed measures to achieve at least a 25% reduction in carbon emission by 2030. Refer to the Methods of Measurement and Basis of Payment for further details.
Methodology & Resources (15%)	**This section includes, but is not limited to, the following issues as relevant to the carrying out of the Contract Works. You must as a minimum include a comment on each of the items listed and on any other issues in respect of this attribute that you consider are relevant.** **Methodology information should encompass, but not be limited to, the following:** a) Client liaison (including approach to team working). b) Overall outline methodology to be adopted for operation of the landfill including: • The Tenderers proposed systems for provision of the landfill as a service to customers in the Hutt Valley and wider Wellington region (customer care/management, communications, account management, invoicing etc). • Waste handling (including special wastes) and placement (including placement of daily cover and landfill capping).

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Criteria	Evaluation will be undertaken on the following requested information
	• Control of compaction effort to achieve the specified compaction targets, including an indication of the proposed compaction equipment (including weight and on-board technology) for refuse compaction. • Demonstrate an understanding and operational methodology for Phase 2 and 3 of the landfill operations. Tenderers shall outline their proposed approach to the transition to the phase 3 filling operation, as set out in the Specification and Drawings. This shall include an outline methodology regarding the number of tip faces, loading and unloading of waste, transfer of waste to the phase 3 tipping pad via the phase 3 access road (including proposed type of transfer vehicle) and placing of waste in the phase 3 cell. • Operation of the weighbridge, kiosk and transfer station. • Maintenance of landfill assets as specified (including roads, kiosk and weighbridge, transfer station, drainage and leachate systems, erosion and sediment controls, the main silt pond and dam assets etc). • Interfacing with and directing landfill customers (including the public, public relations, commercial customers, health and safety instruction/induction etc), invoicing and financial management. • Interfacing with other key landfill suppliers such as the gas field operator and the capital works contractor. • Storage and submission of records. • Traffic control on and around the landfill to ensure traffic signs and landmarking are safe, compliant, adequate and as far as reasonably possible keeping commercial vehicles separate to the public. c) The Tenderer shall demonstrate understanding of Council's key objectives and how they can contribute to achieving these, including contribution to broader outcomes such as community development and transition to a low carbon economy. d) The Tenderer shall document initial thoughts and approach to delivering sustainability outcomes including reducing energy use, low impact water management and emissions reductions. This shall include planned reporting on operational activities, environmental management and to meet Council's sustainability and carbon reduction commitments and obligations. e) The Tenderer shall document ideas and approach to delivering enhanced resource recovery through the delivery of the services. f) The Tenderer shall highlight innovations beyond standard industry practice that address cost and maximise the social, environmental and cultural benefits of the contract. g) The Tenderer shall document any value-add services or infrastructure that the Tenderer can offer in the context of the partnership framework and support achieving councils key objectives. h) Compliance with the landfill's resource consents, Specification and the Landfill Management Plan i) Management of employees, subcontractors and others where required and workloads. j) Administration of the contract (including works instructed by the Principle or Engineer, quality planning and control)

Criteria	Evaluation will be undertaken on the following requested information
	k) Adequacy and availability of resources, including: • Numbers of suitably qualified and experienced staff proposed for this project and their availability. • Plant and equipment to be used and their availability including low carbon where viable. Examples include light vehicles (hybrid or fully electric) and operational plant. • Specialised plant proposed for this project (including refuse compactor, transfer pit loader, phase 3 trasnfer plant etc) and its availability. • Proposed use of local subcontractors (Note local contractor use will not be given evaluation preference). • Location of resources. • Communication systems.

Criteria	Evaluation will be undertaken on the following requested information
Price (30%)	As outlined in Cl 118 Tender Evaluation.

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Attachment D – Statement of Departures Form

Note: This form must accompany each Tender submitted. See also clause 106 of the Conditions of Tendering.

TENDER FOR:	**Silverstream Landfill Operations Contract**

We acknowledge the Conditions of Tendering, clause 106 and hereby declare that our tender submission is based on the Tender Documents, and the following clarifications, tags and assumptions.

Please provide an electronic copy (Word document in 'Landscape format') with your tender response.

No.	Clause/ref	Tender clarification/contractual tag	Principal's response	Contractor's response	Agreed position
General					
1.					
2.					
Conditions of Contract					
3.					
4.					
Technical clarifications					
5.					
6.					

Name of Tenderer:	
Signed by authorised signatory of the Tenderer:	
Name and title of authorised signatory:	
Date:	

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Attachment E – Tenderer's Business Details (including References and Banker's Details)

NAME OF BUSINESS: .....

GST REGISTRATION NUMBER: .....

PHYSICAL ADDRESS OF BUSINESS: .....

POSTAL ADDRESS OF BUSINESS: .....

TELEPHONE NO: ..... FAX NO: .....

NAME AND ADDRESS OF DIRECTORS / MEMBERS / PARTNERS / PROPRIETORS

FULL NAMES	ADDRESSES	TEL NO

TRADE REFERENCES (PLEASE SUPPLY THREE) – In supplying the trade references the Tenderer authorises the Principal to contact the references regarding the Tenderers ability to undertake the Contract.

FULL NAMES	ADDRESSES	TEL NO

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BANKER'S DETAILS:

The Tenderer's banker may be contacted by the Principal regarding the Tenderer's ability to undertake the Contract.

NAME	CONTACT DETAILS

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Attachment F – Health, Safety and Environmental Pre-Qualification Form

CONTRACTOR HEALTH, SAFETY AND ENVIRONMENTAL PRE-QUALIFICATION FORM

TENDER FOR:	**Silverstream Landfill Operations Contract**

In order that the Principal and the Contractor meet their mutual health and safety obligations under the Health and Safety at Work Act 2015 and all associated regulations, the Accident Compensation Act 2001 and the Resource Management Act 1991 please provide the following information:

SAFETY POLICY AND MANAGEMENT COMMITMENT	**Yes**	**No**
(a) Has the Contractor implemented a Safety Management System in accordance with ISO 45001 , OHSAS 18001 or similar approved Health and Safety Management System?	☐	☐
(b) Has the Contractor implemented an Environment Management System in accordance with ISO 14001, Envirostep or similar approved? (Current qualification to be forwarded for (a) – (b)).	☐	☐
SAFETY AND ENVIRONMENTAL TRAINING	**Yes**	**No**
(c) Will training specific to the Contract be given to the Contractor's employees?	☐	☐
(d) Have the Contractor's employees been given all appropriate training regarding safety equipment and any other equipment intended for use on the Contract?	☐	☐
(e) Does the Contractor's First Aider and Safety Supervisor possess current qualifications?	☐	☐
SAFETY RECORDS	**Yes**	**No**
(f) Has there been any cautioning notices or prosecution by Worksafe, or local or regional environmental regulatory authority? If ticked "Yes" please provide details of the cautioning or prosecution on a separate sheet	☐	☐
SUBCONTRACTORS	**Yes**	**No**
(g) Are safety and environmental requirements specified for the Contractor's Subcontractors? If ticked "Yes" please specify.	☐	☐

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SUBCONTRACTORS

		Yes	No
(h)	Does the Contractor have procedures for the control of the safety and environmental performance of Subcontractors?	☐	☐

On behalf of the Contractor, on signing this form, I confirm that:

Declaration	Yes	No
I am authorised to provide this information and sign this form.	☐	☐
The information provided in this form is true and correct.	☐	☐
I understand that if the information I have provided is not true and correct, the Principal may terminate any future Contract (if the Principal has reasonably relied on the accuracy of information provided in this questionnaire) at any time and with immediate effect by written notice.	☐	☐
I understand that the Contractor will be liable for anything the Principal has done or omitted because it has reasonably relied on the accuracy of information provided in this questionnaire.	☐	☐
I agree to abide by the requirements of the Health and Safety at Work Act 2015 and any amendments, Principal's induction, including those specifically outlined above.	☐	☐

Name of Tenderer:	
Signed by authorised signatory of the Tenderer:	
Name and title of authorised signatory:	
Date:	

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Attachment G – Financial Position Pre-Qualification Form

TENDER FOR:	**Silverstream Landfill Operations Contract**

(a) Corporate Structure

Tenderers must provide details of their overall corporate structure, including where a Tenderer entity sits within that corporate structure.

(b) Financial Position

Tenderers are to provide a financial statement for the past three (3) audited financial year(s) (if possible) to evidence the Tenderer's financial capacity to undertake the Contract Works.

Where a Tenderer is not the ultimate parent company, the Tenderer shall identify the ultimate parent company that will provide a parent company guarantee to the Principal in support of the Contractor's obligations under the Contract (on the form attached at Schedule 18 of the Contract). The Principal reserves the right to carry out financial due diligence on such parent company, including requesting the financial statements required by this Form.

In addition, Tenderers are to complete the following questionnaire providing further details where the answer is 'Yes'.

Note: each organisation involved in a joint tender must submit a separate questionnaire.

#	Question	Answer
1)	How long has the Tenderer's organisation been in business for?	
2)	What other projects is the Tenderer's organisation currently employed on as head contractor, and what is the approximate combined value (NZD) of such projects? The Principal is particularly interested to understand what other projects the Tenderer's organisation will be involved with during 2023.	
3)	Are there any significant events, matters or circumstances which may significantly affect the operations of your organisation?	Yes / No
4)	Are there any proceedings, either actual or threatened, against your organisation, its parent or any director of the organisation, its parent or associated entities or have there been any in the past five years? If so, what remedial action has been taken in respect to these proceedings?	Yes / No

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5)	Are there any bankruptcy or insolvency type actions (actual or threatened, including, without limitation, voluntary administration, action to wind up or other similar actions) against a director of the organisation, the organisation or its parent or associated entities, or has there been any within the past five years?	Yes / No
6)	Are there any de-registration actions against the organisation, its parent or associated entities, or have there been any in the past five years?	Yes / No
7)	Are there any factors that could adversely impact on the financial ability of your organisation to successfully perform the obligations stated in this Invitation?	Yes / No
8)	Is a merger / sale / restructure in contemplation?	Yes / No
This questionnaire has been completed by the following person:		
Name:		
Position:		
Organisation:		
Date:		
Signature:		

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Attachment H – Key Personnel Listing Form

TENDER FOR:	**Silverstream Landfill Operations Contract**

The Tenderer must complete the following table regarding key personnel (Including key roles pre-filled in the table below) who will be involved in the Contract Works.

Name of proposed Key Personnel	Description of Role/Position	Previous Experience (or refer to CV to be included)	Percentage of time Key Personnel will be involved in the Contract Works
	Contract Manager / Contractor's Representative		
	Landfill Manager		
	Site Supervisor/ Foreman		
	Quality Manager		
	Health and Safety Supervisor		
	Environmental Manager		
	Sustainability/decarbonisation and Innovation Manager		

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Attachment I – Insurance Information Form

TENDER FOR:	**Silverstream Landfill Operations Contract**

The Tenderer must provide details of its insurance policies as listed below.

In addition, the Tenderer should provide a letter or certificate from the insurer(s) confirming that the Tenderer and insurer are prepared to enter into the insurances described below should the Tenderer's Tender be accepted.

Type of Cover	Sum Insured	Deductible	Expiry Date	Name of Insurer	Policy No.
Plant					
Public liability					
Motor vehicle					
Professional indemnity					

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Attachment J – Conflict of Interest Declaration Form

TENDER FOR:		**Silverstream Landfill Operations Contract**
TENDER FOR:	**Silverstream Landfill Operations Contract**	

CONFLICT OF INTEREST DEFINITION:

A conflict of interest is a situation in which a Tenderer could gain (or be seen to gain) an unfair advantage through an association with an individual or organisation. Associations include financial, personal, professional, family-related or community-related relationships.

- An actual conflict of interest is where there already is a conflict.
- A potential conflict of interest is where the conflict is about to happen or could happen.
- A perceived conflict of interest is where other people might reasonably think there is a conflict.

QUESTIONNAIRE:

Note: each organisation involved in a joint tender must submit a *separate* questionnaire and declaration.

	QUESTION	**RESPONSE** (Select one answer for each question. Select "potentially" if others could perceive that a conflict exists.)
1.	Does any person in your organisation have a close friend or relative who is (or could be) involved in any evaluation or decision-making relating to this procurement process?	Yes / No / Potentially
2.	Has any person in your organisation recently offered any special discounts, gifts, trips, hospitality, rewards or favours to any person involved in any evaluation or decision-making relating to this procurement process? *(e.g. free travel, free samples for personal use)*	Yes / No / Potentially
3.	Does any person involved in any evaluation or decision-making relating to this procurement process have a financial interest in your organisation? *(e.g. the person*	Yes / No / Potentially

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	is an employee of, or a shareholder in, your organisation)	
4.	Are you aware of anything that might give the appearance that any person involved in the evaluation stage or decision-making stage of this procurement process is biased towards or against your organisation? *(e.g. the person has used your organization's corporate box)*	Yes / No / Potentially
5.	Is there anything else that we should know?	Yes / No

If you answered "**Yes**" or "**Potentially**" to any of the questions above, please set out the details of the situation below.

Declaration: I declare for and on behalf of the Tenderer that the information provided in this document is true, complete and accurate to the best of my knowledge and on behalf of the Tenderer identified below, and agree to notify Hutt City Council as soon as possible of any conflicts of interest that arise (or could arise) in the future.

Name of Tenderer:	
Signed by authorised signatory of the Tenderer:	
Name and title of authorised signatory:	
Date:	

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Schedule 25 - Contractor's Tender

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Waste Management®

Request for Tender

In response to the call for Requests for Tender

By: Hutt City Council

For: Silverstream Landfill Operations Contract

Date of this Registration: Friday 3 June 2022

Contract number: AD22-2102

Submission 1 - Non-Price Attributes and Other Information

HUTT CITY
TE AWA KAIRANGI

EXECUTIVE SUMMARY

Waste Management (WMNZ) is delighted to be able to provide this proposal to offer Hutt City Council (HCC) the best possible options for the operation of the Silverstream Landfill and the establishment and operation of a world class Resource Recovery Park (RRP) servicing the wider Hutt Valley and Wellington regions.

Experienced and Motivated Partner

Council requires a solution which ensures that its waste facilities are well run, minimise risk, deliver on waste minimisation and carbon reduction targets, employ best practice and continually improve over the remaining life of the landfill before transitioning to a steady aftercare state. Delivery of this is core to WMNZ and is exactly what we do every day across New Zealand at our own landfills and at Council facilities.

WMNZ owns and/or operates seven landfills across Aotearoa New Zealand, including four of the top five (by volume and performance), and sets an industry standard benchmark for operational and environmental performance that is unequaled by anyone in the sector.

To achieve and maintain this very high level of performance WMNZ has a dedicated division of specialist landfill engineers who, together with their support team are available to assist any site within the operating business as and when required.

Environmental Sustainability – including Caring for and Protecting our Environment

As a part of our For Future Generations initiatives WMNZ has recognised the responsibility we have to protect, preserve and enhance the environment in which we operate in order to ensure a better Aotearoa for future generations of New Zealanders. All WMNZ operations and sites perform to the highest environmental standards and are regularly audited both internally and externally to ensure this standard is maintained.

Waste Minimisation and Carbon Reduction

WMNZ has accepted the critical requirement for New Zealand (and the world) to take immediate and dramatic action to manage and reduce carbon emissions.

With the growing and vital move toward waste minimisation and resource recovery as key tools in our approach to minimising the impact of climate change and reducing net carbon, WMNZ is uniquely positioned to be able to deliver the fully integrated suite of tools and capability needed to tie together a comprehensive and highly adaptable solution.

As the first waste company in New Zealand to have our carbon footprint independently audited, and to set (and meet) aggressive annual reduction targets for carbon emissions, we understand just how much these outcomes need uncompromising focus in order to deliver the required results.

WMNZ has taken, and continues to take, a proactive approach to introducing initiatives and operating changes that reduce the carbon impact of all of our collection and processing facilities. This focus is now embedded in the company strategy whereby we have committed to take a leadership role in transitioning to a circular economy and in the journey to a carbon positive future for Aotearoa.

The target set by HCC for carbon reduction within the operation of Silverstream Landfill fits very well with this strategy and has formed the basis of the WMNZ approach to this proposal.

Transition to electric and hybrid operating plant as these are able to be sourced together with a reassessment of the size and utilization requirements of all plant on site, will see WMNZ achieve close to a 40% reduction in carbon over the base year well before 2030. When coupled with other initiatives under discussion with Z Energy and the efficiencies that will be achieved operating the landfill in conjunction with the WMNZ resource recovery park, we believe that the targeted 50% reduction in carbon by 2030 will be met.

Investing in Infrastructure

The waste services provided across New Zealand by WMNZ are essential. They fundamentally underpin the quality of life that we all enjoy. The safe collection, processing and disposal of waste is critical if we are to safeguard and protect New Zealand's natural and physical resources for future generations. Delivery of these services and ensuring we meet this objective requires innovation, planning and investment, but even more importantly it requires WMNZ to be actively involved with the many communities that we service. The local community based around Silverstream Landfill is, and will remain is very much a part of this approach.

A long history of operating the Silverstream landfill and working closely with HCC has provided us with a wealth of experience and expertise that we can now bring to deliver a fully integrated waste minimisation approach to providing these services into the future.

The development of a full resource recovery park (RRP) near to the Haywards interchange by WMNZ will bring a new level of focus to recycling, resource recovery/reuse, and waste minimisation services in the Hutt Valley and the wider Wellington region. For WMNZ to be able to tie these services into the operation of the Silverstream Landfill offers even more potential to improve the efficiency of the landfill operation, reduce traffic movements, and reduce the wider carbon footprint of waste and material recovery services across the region.

The development of our flagship RRP in Hamilton has given us great practical insight into what matters to those using the site and into how we can make the experience on-site as positive as possible for all. The use of automated weighbridge and payment technology in conjunction with fully covered drop off areas, easy access to free recycling drop off areas, the reuse/repair shop and community education centre, and clear processes for drop off of any recoverable material, have all led to an increase in recovered material and a reduction in residual waste heading to landfill.

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Summary

We believe that we are perfectly positioned to be able to bring our expertise and experience of real and functioning processes to HCC and the continued operation of Silverstream landfill. We can do this in such a way that builds on that experience yet changes dramatically the approach and outcomes as we work together to deliver an ongoing programme of improving sustainability, efficiently operating the landfill, reducing residual waste and increasing recovered material for reuse and recycling.

We look forward to being able to expand on this Request for Tender and presenting to HCC a

Yours sincerely,

s7(2)(a)

General Manager - Lower North Island
Management NZ Limited
s7(2)(a) @wastemanagement.co.nz

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HUTT CITY TE AWA KAIRANGI

Tō tātou tāone
Our city

Pass/Fail Requirements

Health and Safety | Financial Stability | Decarbonisation

(A) GENERAL CRITERIA

Image: Transfer Station, Silverstream Landfill.

PASS/FAIL REQUIREMENTS

Health and Safety Evaluation

WMNZ has completed Attachment F – Health, Safety and Environmental Pre-**Qualification Form** in Appendix A along with the required supporting documentation

Financial Stability Evaluation

WMNZ has completed **Attachment G – Financial Position Pre-Qualification Form** in Appendix B along with the required supporting documentation

Decarbonisation

WMNZ has the required pass/fail credentials for decarbonisation. WMNZ has a corporate carbon footprint and a sustainability strategy. We have included evidence for this in Appendix C.

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Tō tātou tāone
Our city

Health and Safety (10%)

Attachment C | Non-Price Attribute Evaluation Criteria

(B) COMPARATIVE CRITERIA

Image: Silverstream Landfill.

Health and Safety (10%)

A) Health and Safety Plan

We have included a copy of our corporate Health and Safety Policy in Appendix D.

B) Company Health and Safety Coordinator

s7(2)(a) is WMNZ's Head of Safety and Risk. s7(2)(a) oversees our Health, Safety, Environmental and Quality performance for WMNZ.

s7(2)(a) sits at EMT (Executive Management Team) level reporting directly to the Managing Director and Board and has the ability to direct change as deemed appropriate to the company.

He is accountable for ensuring Corporate Risk is managed across all divisions. His extensive knowledge of the waste sector enables him to achieve individual buy-in and accountability across all levels ensuing high HSEQ performance. s7(2)(a) is supported by a team of local compliance coordinators located at WMNZ branches throughout New Zealand.

C) Outline of Relevant Health and Safety Plan

WMNZ has an existing Safety Management Plan for Silverstream Landfill that has been reviewed and prepared by internal WMNZ Health and Safety Specialists and has been circulated to HCC and other PCBU's (Person Undertaking Business or Undertaking) operating on and around the landfill. Should WMNZ be the preferred tenderer, we would update this plan to capture health and safety processes for the transitioning from Phase 2 and 3 development works for the landfill. We have included a copy of our current Safety Management plan in Appendix A and outline below key pieces relevant to carrying out the contract works:

Accepting Responsibility for Risks

Silverstream Landfill is owned by HCC; however, the day-to-day operations are contracted to WMNZ.

The landfill was opened for operation in 1972 and has gone through a number of significant design changes from the initial landfill which was unlined. Leachate drainage was installed to the current Phase 2 which is designed to meet Class A landfill requirements.

Silverstream Landfill is a putrescible refuse disposal site for the Hutt Valley and Upper Hutt region; it is available to domestic type customers, visiting with cars, utility vehicles, trailers and vans plus commercial customer(s) larger trucks etc. This makes the site on occasion very busy, and so care is required when driving about.

Organisations Involved at Silverstream Landfill

A number of key organisations are involved to effectively manage Silverstream Landfill; they are:

- Hutt City Council (Owners)
- WMNZ (Daily Operations)
- Tonkin & Taylor (Engineers & Monitors)
- LMS (Methane recovery & power generation)
- EarthLink (Op Shop Recovery)
- Contractors (Capital Works)

Each of the organisations above are PCBUs and have responsibilities and duties to ensure that people and the environment at Silverstream Landfill are kept as safe as possible from any harm.

It is recognised that WMNZ can be responsible for only advising the nature of, and methods of controlling hazards specific to WMNZ's business and/or activities and that the PCBU shall apply best industry practice to ensure the safety of all involved at all times.

It is recognised that WMNZ can be responsible for only advising the nature of, and methods of controlling hazards specific to WMNZ's business and/or activities.

The WMNZ Silverstream Landfill Safety Management Plan, on-line Site Induction and Site Information Sheet addresses this requirement by "advising the nature of, and methods of controlling hazards specific to WMNZ's business" as it relates to Silverstream Landfill.

It is the responsibility of the HCC, LMS Generation, Tonkin & Taylor, Geotechnics, Leach & Co, Earthlink, and others not engaged by WMNZ to communicate the health and safety requirements for accessing and /or operating at Silverstream Landfill to their employees, consultants, contractors, sub-contractors, service providers, suppliers and visitors.

This communication could include a copy of the WMNZ Safety Management Plan (SMP), on-line Site Induction, Site Information Sheets, and/or the Consultants, Contractors, Sub-Contractors SMP. The flowchart on the following page provides a guide to what is required and by whom.

The 'Sign-in/Sign-out' procedure at the kiosk is mandatory to ALL contractors and visitors (other than members of the public travelling to and from the Transfer Station) accessing the site beyond the kiosk.

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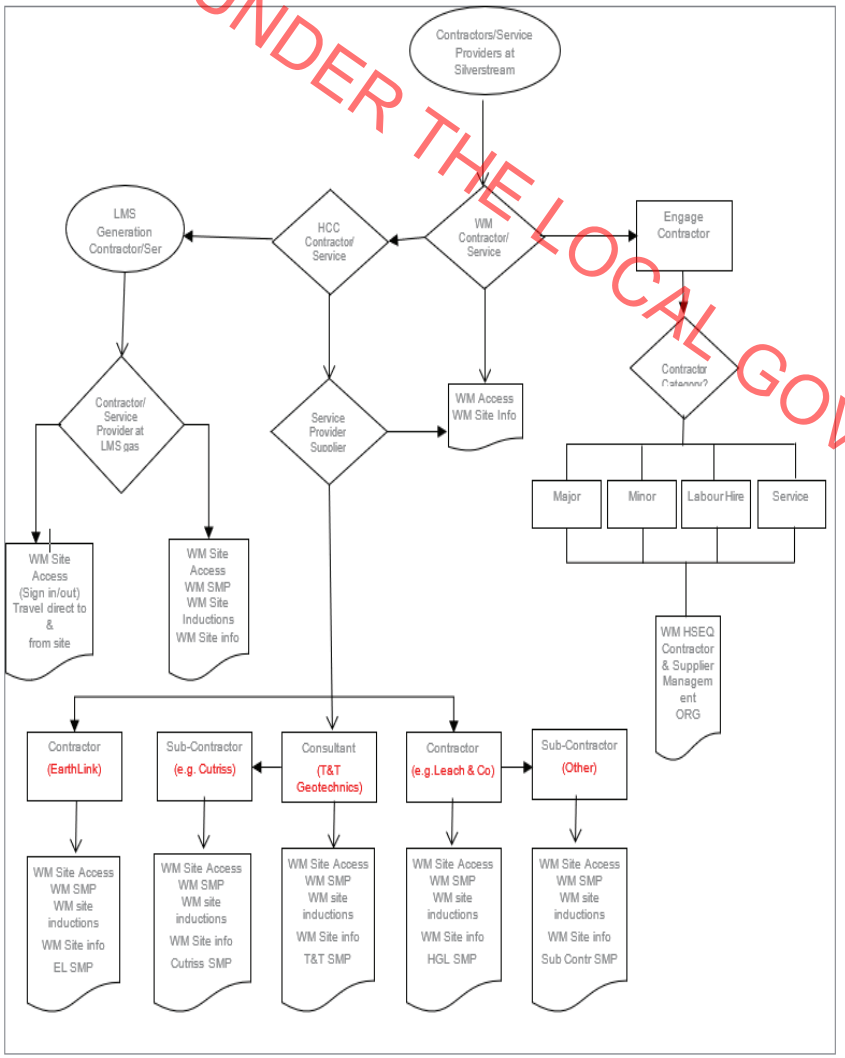
Silverstream Landfill Site Management Flow Chart



Controlled copies of the WMNZ Safety Management Plan, on-line Site Inductions, Site Information Sheets are available from the WMNZ Silverstream Landfill Manager.

Phase 3 Development

WMNZ recognise that the Phase 3 development is still at an early stage of planning and as demonstrated by our alternative proposal, WMNZ believe there are other methodologies and access options for consideration. We are therefore open to any level of involvement requested by HCC and/or the designing engineer to assist or support development of final methodologies and any associated risk assessments and safety in design reviews.

Managing Risks and Health and Safety Obligations

WMNZ has an in-house Health, Safety, Environmental, and Quality (HSEQ) Management System to manage the Quality, Safety and Environmental aspects of its activities, products, services and operations, and to ensure compliance with consent requirements, regulations, standards and laws.

The WMNZ HSEQ System has a structure featuring Elements and HSEQ Standards.

WMNZ has developed and maintains a Site Risk Register for the areas and/or activities it manages at Silverstream Landfill.

The Site Risk Register identifies the areas of risk, related hazards and controls required to minimise the risk of injury or damage occurring. A portion of the register is available in Appendix E.

Top-10 Critical Risks

A suite of the Top 10 Critical Risks for the site has been identified and posters listing these critical risks are displayed at prominent positions throughout the site.

These 'Top 10 Critical Risks' are:

- Collisions with moving or stationary objects or people.
- Explosion.
- Loss of control.
- Overcome by fumes or gases.
- Exposure to hazardous substances.
- Insecure loads.
- Exposure to uncontrolled energy.
- Fall from heights.
- Drug and alcohol impairment.
- Accidental firearm discharge.

Each Critical Risk is the topic for a monthly safety campaign. The Critical Risk(s) for the month will be discussed in toolbox talk meetings. Where possible, training in the Critical Risk area will be conducted. Monthly Workplace Inspections will be conducted focusing on the Critical Risk(s). Identification of new hazards on the site is carried out using the following methods:

- Safety interactions.
- Safety observations.
- Workplace inspections.
- Key risk observations.
- Incident/injury reporting.
- Near miss incident reporting.
- Staff reporting of opportunities for improvement.
- Monthly review of the Risk Registers (as part of the Top 10 Critical Risk campaign).
- Risk assessments.

Consultation

WMNZ Managers and Supervisors at Silverstream Landfill are required to consult all staff, so far as reasonably practicable, on matters that directly affect or are likely to directly affect staff health, safety or welfare. Consultation is undertaken via the Daily Toolbox briefings. In addition, monthly 'toolbox talks' are a supplementary consultation mechanism. Consultation is required:

- During risk management processes;
- When making decisions regarding facilities related to welfare, e.g. amenities;
- During development of HSE policies and procedures;
- When changes are proposed to:
  - The workplace;
  - Machine/equipment, substances, processes and other things used at Silverstream Landfill;
- The work performed that may affect the health and safety of staff.

Consultation shall include contractors and any staff of the contractor(s) who perform work over which the WMNZ Manager and/or Supervisor has control. This includes staff hired through labour-hire companies. Consultation includes:

- Sharing information with staff – information shall be made available in a timely way and shall be provided in a form that can be understood by staff;
- Giving staff a reasonable opportunity to express views about the matter – time shall be made available for staff to consider the issues and they should be encouraged to ask questions, raise safety concerns, make safety recommendations and be part of the problem-solving process;
- Taking those views of staff into account in the decision-making process;
- Advising staff of the outcome of consultation in a timely manner.

Name, Qualifications and Experience of HSEQ Compliance Role

s7(2)(a) WMNZ's Head of Safety and Risk is our proposed HSEQ Compliance Role for the Silverstream Landfill Operations Contract. As our Head of Safety and Risk since 2012, s7(2)(a) plays a critical role, holding overall responsibility for providing HSEQ leadership to our New Zealand businesses and setting our operating standards. He ensures a Health & Safety-First culture that is directly reflected in our Council contracts. s7(2)(a) will be supported by a local compliance coordinator for implementing processes and procedures into Silverstream Landfill, who will be based in our Wellington branch office.

Qualifications and Training Relevant to Position:

- Environmental Management Systems ISO14001.
- Certificate in Environmental Management.
- Lead Internal Auditor.
- Connexis Advanced Assessor.
- UK Business Studies.
- B Grad Quarry Manager.
- Member of NZISM.
- Chair of the WasteMINZ H&S Committee.

Relevant Experience:

Head of Safety and Risk, WMNZ, 2012 – Present

s7(2)(a) in-depth HSEQ knowledge shows in his leadership in WMNZ's New Zealand sses, setting operating standards and ensuring a Health & Safety-first culture. He also ensures compliance to ISO and ACC Partnership standards and requirements.

He is also a nationally recognised specialist. In a previous role, s7(2)(a) developed a range of internal environmental and health and safety training programmes, still used within the civil construction industry throughout New Zealand. His strong yet collaborative communication style has enabled him to develop relationships with the management teams across our business. He has the influence, experience, and knowledge to ensure safe, quality, and compliant service delivery.

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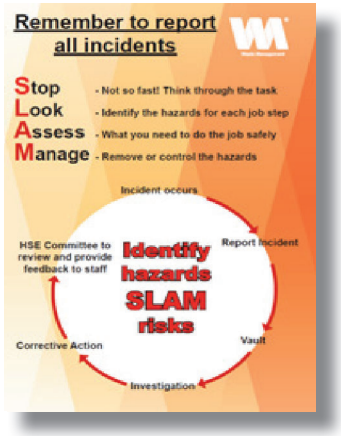
Personnel Trained in First Aid

The following Silverstream Landfill personnel have been trained in First Aid and CPR:

Silverstream Personnel Trained in First Aid		
First Aider	Name	Role
First Aider	s7(2)(a)	Landfill Manager
First Aider		Landfill Operator
First Aider		Landfill Operator
First Aider		General Labourer
First Aider		Weighbridge and Customer Assistant
First Aider		Landfill Operator
First Aider		Landfill Operator

Accident and Incident Reporting and Recording Procedure

WMNZ requires that ALL Incidents, Injuries, Near Misses and Identified Hazards are reported immediately, however small or insignificant they may appear to be. Reporting, Investigations and Corrective Actions must meet the requirements set out in HSEQ QRG 6.1.1.01.



Incidents and Injuries, Near Misses and Hazards can be reported in the following ways.

- Verbal report (including via RT) to Supervisor or Manager;
- Direct entry into the V form (pre curser to The Vault);
- Completion of an 'Event Report' Pad forms (pads are located at the office, kiosk and mobile plant).
- All incident and hazard reports will be investigated, and corrective actions developed to prevent re-occurrence or to minimize the risk.
- Injuries requiring First Aid Treatment (FAT) will be reported to the General Manager and the Head of Safety and Risk.
- All Medical Treatment Injuries (MTI) and Lost Time Injuries (LTI) will be reported to the General Manager, Head of Safety and Risk and Managing Director immediately.
- All Incidents and Injuries will be managed in The Vault. Any Incident or Injury with a severity rating of Minor or above is automatically escalated to Senior Management and an incident report is automatically emailed.
- Any incident resulting in a notifiable event must be immediately reported to the WMNZ Head of Safety and Risk and WMNZ Managing Director. The WMNZ Head of Safety and Risk will then report the incident to Worksafe New Zealand. The WMNZ Head of Safety and Risk will assign an Investigator to carry out the incident investigation.

Site Emergency Management Plan

A Site Emergency Management Plan (SEMP) has been developed for Silverstream Landfill. The SEMP identifies actions to be taken in the following emergency situations:

- Fire;
- Medical Emergency;
- Personal Threat;
- External Emergency;
- Unidentified Hazardous Substance;
- Spill of Oil or Diesel or Environmental Incident;
- Natural Emergency.

The plan also lists internal and external emergency contacts and external service providers. In addition to the SEMP, Emergency Wardens for the site have been assigned and trained. First Aid personnel have been trained and first aid kits are available throughout the site. The names of Emergency Wardens and First Aiders are posted on the HSE Notice Boards. Every six months, Emergency Evacuation drills are conducted at the site. The SEMP must meet the requirements set out in HSEQ PL 2.1.3.01.01. A copy of the SEMP is available in Appendix F.

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D) Summary of Accident Statistics for Last Two Years

WMNZ has made significant investment into the health and wellbeing of our staff in recent years. Our very serious focus on Health and Safety is reflected in the dramatic reduction of incidents. The total TRIFR for the current calendar year stands at an industry leading 3.0 (TRIFR includes Lost Time Injuries (LTI) and Medical Treatment Injuries (MTI). Whilst our target remains at zero, as a comparison, a TRIFR score of four is a world class standard.

	Annual Incident				As at May 2022		Annual Rate		
Year	Fatality	LTI	MTI	FAT	Employees	Hours	LTIFR	MTIFR	TRIFR
2021	0	3	7	250	1489	3,077,388	0.9	2.1	3.0
2020	0	1	4	281	1520	3,398,404	0.3	1.2	1.5

*LTI – Lost Time Injury *MTI – Medical Treatment Injury *FAT – First Aid Treatment/No Treatment

E) Summary of our Health and Safety Credentials

Awards Received

WMNZ regularly wins awards for our industry leading safety and sustainability practices, as well as our innovations towards making the circular economy and a carbon zero future for Aotearoa New Zealand a reality. Recent highlights include:

Australasian Fleet Champions Awards 2021

- Safe Vehicles Award – winner - won main prize for our LEV safety barrier innovation, which is a first-of-a-kind design in New Zealand. The device eliminates the risk of a driver being able to exit a vehicle when it's moving. The barrier is linked to an electronic door release which connects to the engine management system.
- Road Safety in the Community Award – winner - participation in the Share the Road initiative, where our team members regularly take part in community information sessions designed to keep cyclists safe around heavy vehicles. We have also initiated safety signs to be installed on the rear of some kerbside collection vehicles, which prompt cyclists to pass on the open side when the truck is collecting.
- Fleet Safety Product Award – highly commended - for our Driver Cam initiative – which has installed 700 vehicles to improve driver behaviour, effectively capture any incidents and assist with training.

In addition to the above, the table below demonstrates other awards WMNZ has won:

Awards - Waste Management NZ Limited		
Category	Status	Year of Entry
Auckland Arthur Mead Memorial Environmental Awards	Winner	2001
Renewable Energy Category	Winner	2001
Company of the Year	Winner	2005
Infrastructural Utilities and Networks for Kate Valley landfill, awarded to Transwaste Canterbury and CW	Winner	2006
Champion Canterbury to CWS medium/large business category	Winner	2007
Gold Award of Excellence - Kate Valley Landfill (Tonkin & Taylor and CWS)	Winner	2007
Most outstanding demonstration of packing waste management in NZ	Winner	2009
Champion Canterbury Award: Medium/large business category	Winner	2011
Southern Cross Wellness Award - In recognition of the What Drives You Programme	Winner	2013
Award for Safety, Security and Environmental Innovation.	Winner	2014
DLA Piper Award for Investment between China and New Zealand	Winner	2017
Fleet Champion	Winner	2017
Skills Highway Award	Winner	2017
Teletrac Navman Industry Innovation Award	Winner	2017
Most Sustainable Large Business	Commendation	2018
Road Safety in the Community	Commendation	2018
Smarter Transport	Winner	2018
Sustainable Journeys	Winner	2018
Innovation and Logistics Sector - two entries: EV Programme	Winner	2019
Most Innovative in Agriculture, Mining and Utilities - EV Programme and For Future Generations	Top 10 winner	2019
Excellence in Innovation, Supreme Business Excellence Award	Winner	2020
Supreme Award, Resene Green Building Award, CBRE Industrial Property Award, (Excellence in the RCP Commercial Office Property Award)	Winner	2020

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Prosecutions or Complaints in the Last Five Years

The following table provides a summary of prosecutions or complaints received over the last five years:

Prosecutions or Complaints Last 5-Years					
Year	Council	Type	WM Business Unit	Subject	Corrective Action Taken
2021	Bay of Plenty Regional Council	Abatement Notice	WMNZ Tauranga Recycling	7.1 Discharge of suspended solids to stormwater in excess of prescribed limits. 7.6 Sample analysis shows Copper, Lead and Zinc discharged to stormwater in excess of prescribed limits.	Remedial work agreed with Regional Council to undertake stormwater system upgrades in 2022. An above ground filter has been approved and is currently being installed.
2021	Bay of Plenty Regional Council	Abatement Notice	WMNZ Tauranga Recycling	6.7 Material being stored without cover. 7.7 Results of Sampling not made available to BoPRC within one month. 8. Stormwater system not maintained in good working order.	All remedial work has been completed. Awaiting Council Officer site visit.
2020	Auckland Council	Formal Warning	WMNZ	Formal warning in respect of mud / dirt tracking onto Dairy Flat Highway – Breach of Section 15(1)(b) of the Resource Management Act (RMA) 2001 Mud was being tracked onto the highway from the Redvale Landfill site.	
2019	Taranaki Regional Council	Infringement/non-compliance	WMNZ	Unauthorised discharge - rubbish onto land.	WMNZ has received a letter from Taranaki District Council commending practices. This has been included in Appendix G.
2018	Auckland City Council	Warning	WMNZ	Technical breaches of its resource consent at Redvale Landfill for the level of leachate within the liner exceeds the consent limit in the landfill.	No fine. Leachate level is now below consent limit.
2018	Waikato Regional Council	Infringement	WMNZ	Discharge of stormwater potentially contaminated with leachate, onto land, where it may enter water.	Technical breach relates to a historic stormwater diversion that has been rectified.
2017	Waikato Regional Council	Abatement (2)	WMNZ	Storage and stockpiling of end-of-life tyres in a manner than breaches section 9(2) of the RMA.	Develop an EMP which details the management actions that WMNZ will take to ensure that the risk of stormwater contamination and fire are adequately controlled. Site vacated July 2018.
2017	Waikato Regional Council	Abatement	WMNZ	Breach of condition 3 of consent 108428. This condition requires the Consent Holder to maintain a maximum head of leachate of no more than 300mm on the base liner.	This was an undisclosed condition inherited from the previous owners and fully remedied by WMNZ. Abatement notice lifted and site remains in full compliance with this condition.
2017	Taranaki Regional Council	Abatement	WMNZ	Non-compliance with the Regional Freshwater Plan.	Site stormwater infrastructure identified as having insufficient capacity for significant storm events. Remedial work and upgrade to system capacity completed to bring site to full compliance.

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Company Safety Certifications and Memberships

WMNZ is a member with leading industry groups within New Zealand for Safety, Sustainability, Environmental and Waste Minimisation to ensure we are at the forefront of any updates and education within the Environmental Waste Industry. This reflects our continued dedication in providing and promoting a healthy working environment for staff, our customers, and the community as a whole throughout New Zealand.

- **ISO Accreditation - Accredited to ISO standards:**
  - Quality Management System - ISO 9001.
  - Environmental Management System - ISO 14001.
  - Safety Management System – ISO 45001.
- ACC Fleet Saver Accreditation - ACC Fleet Saver Gold Certification recognises best practice framework in advanced safety management systems and continuous improvements in on-road and workplace health and safety.
- NZ Green Building Council - We are passionate advocates for better, greener buildings and we are working in partnership with the NZGBC to support sustainable building practices. We are the first waste company to meet the New Zealand Green Building Council's Green Star construction and demolition waste reporting criteria .
- Site Safe New Zealand - We are working with Site Safe to provide education and resources on best practice systems and behaviours known to improve on-site health & safety and are Site Safe and SiteWise Accredited.
- New Zealand Institute of Safety Management - The health and safety of our team members is paramount to us and working with NZISM helps ensure our health and safety practitioners have the latest skills and knowledge to do their jobs.
- Impac PREQUAL Accreditation - PREQUAL is an independently managed service that enables a contractor to demonstrate they have been independently assessed and can be trusted to work safely and to get the job done. WMNZ is an accredited Category 4 Contractor with a 91% assessment rate.
- SHE PreQual Accreditation - SHE PreQual has been providing Contractor Pre-Qualification Services to all local government authorities in Waikato and Bay of Plenty (LASS). WMNZ is approved and registered on the Local Authority Contractor Pre-Qualification Database.
- **Tōtika Accreditation** - Health and safety pre-qualification assessments support procurement processes in New Zealand. Governed by Construction Health & Safety New Zealand (CHASNZ), Tōtika has been developed to deliver a common pre-qualification standard and process across industries. WMNZ is accredited to Performing Contractor Status with a score of 100.

Image above: Much of the B&C industry's waste can be diverted to other uses.

Leading the way for the B&C industry

We are the first waste company to meet the New Zealand Green Building Council's Green Star construction and demolition waste reporting criteria.

MEMBER 2020–2021

It means we have proven we can support NZ's building and construction industry meeting Green Star standards by maximising their resource recovery and minimising waste.

The New Zealand Green Building Council (NZGBC) runs Green Star and Homestar - two tools which rate and communicate the sustainability of New Zealand's buildings.

NZGBC chief executive Andrew Eagles has been very complimentary of the work our team has done be the first waste company in Aotearoa to meet their Green Star reporting criteria.

"By successfully completing this process, Waste Management is providing greater assurance to the wider industry and is helping develop further transparency around our sector's waste," Andrew says. General Manager of Customer, Strategy & Sustainability Ingrid Cronin Knight says currently New Zealand's building boom contributes 40 – 50% of all waste.

"New Zealand can do much better. Our services make it possible for more than 70% of building and construction waste to be recycled. We have solutions for every kind of construction project, small or large-scale, and we can now provide the certified waste reporting to achieve Green Star requirements.

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Other Relevant Information

Complying with Silverstream Operating Standards

WMNZ has a comprehensive national safety management and risk assessment system that is audited internally and externally at both site and company levels. WMNZ is a tertiary level participant in the ACC partnership programme and has a strong focus on safety and injury elimination.

WMNZ has been managing the operation of Silverstream Landfill for more than 20 years. WMNZ staff at the landfill manage the placement, disposal, refuse cover and capping off. They also manage the on-site transfer station plus the collection of fees and account holders.

All on-site resources, staff, equipment, and yellow gear is provided and operated by WMNZ, including the landfill compactor, front end loader, dump truck, excavator, bulldozer, hook truck, roller, and tractor.

WMNZ has in place a comprehensive Silverstream Landfill Safety Management Plan detailing responsibilities and actions for each of the associated site entities. This document has been welcomed by HCC and has been included in Appendix A. Should WMNZ be the preferred contractor for the continued operation of Silverstream Landfill, our health and safety processes and procedures including the Landfill Safety Management Plan will be reviewed and updated to accommodate the new development phases.

Drug and Alcohol Testing

All employees at WMNZ undergo pre-employment medical testing (including drug and alcohol testing), providing a base line of their fitness to undertake the work required and any issues relating to previous employment environments e.g., hearing, and pre-existing injuries.

WMNZ has a zero drug and alcohol tolerance. We do not want to put our staff or customers at risk and therefore do not allow any staff to operate under the influence of drugs or alcohol. We also engage The Drug Detection Agency (TDDA) for running random drug and alcohol testing of our staff. This process is authorised and initiated by our Corporate HSEQ Division. TDDA randomly selects a minimum of 10% of operational, support and management staff per month to be tested.

Local Compliance Coordinators

WMNZ invests significantly into health, safety, and environmental processes, practices, and specialists within our business. This includes investment in safety technology on our fleet, to having a dedicated team of Health, Safety and Environmental experts embedded within our business. WMNZ has a national, divisional, and training team responsible for deploying and managing our HSEQ Management System. This team is also supported by 25 regional Compliance Coordinators dedicated with providing branch and customer level support.

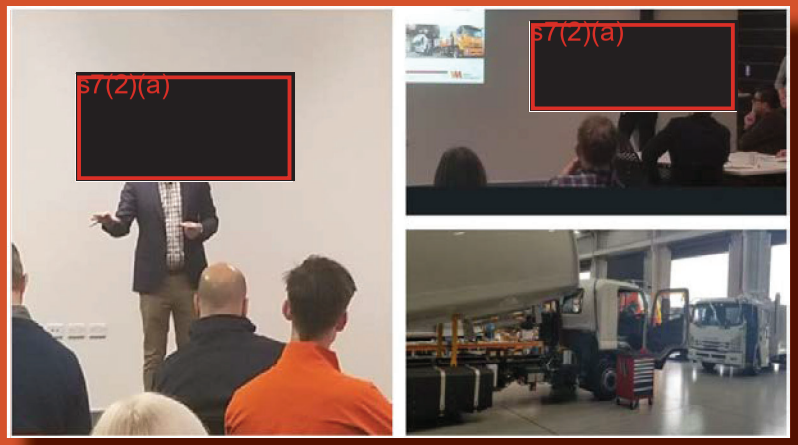

Image: (left) WorkSafe Chief Executive s7(2)(a) and (top) Technical Manager - s7(2)(a) Singh.

Health and safety leadership visit East Tamaki

Waste Management hosted New Zealand's health and safety leaders at our Auckland HQ in June 2021.

It was part of the Health & Safety Association NZ (HASANZ) quarterly Safety Forum, with H&S representatives from across the country attending to learn the latest in health and safety developments.

To start the forum, Managing Director s7(2)(a) gave an introductory briefing about Waste Management's health and safety practices. He was followed by the Chief Executive of WorkSafe s7(2)(a), who presented his vision for the next 10 years and explained how we can all contribute to improving health and safety outcomes.

The forum was also a great opportunity to demon rson how Waste Management follows best practice, with Head of Safety & Risk s7(2)(a) organising a tour of our facilities at East Tamaki Road.

Technical Manager – s7(2)(a) and Senior Project Engineer – Electric Vehicle s7(2)(a) gave an e p about our electric vehicle conversion programme, and the health and safety challenges, culminating in a tour of the Innovation Hub.

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HUTT CITY TE AWA KAIRANGI

Tō tātou tāone
Our city

Track Record (20%)

Attachment C | Non-Price Attribute Evaluation Criteria

(B) COMPARATIVE CRITERIA

Image: School visit, Silverstream Landfill.

Track Record (20%)

Track Record Generally

Waste Management NZ Limited

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Track Record Generally

WMNZ provides the following information as track record generally as a company:

A) Record of Completion:

- On Time
- Within Budget
- To Specified Performance Targets

WMNZ is the leading provider of waste and environmental services in New Zealand, with a comprehensive national footprint and extensive technical capability. We provide world-class waste services right across New Zealand, including in the Wellington region. The success of Council contracts is often measured by the results of key performance indicators and annual resident satisfaction surveys. WMNZ, as an entity with a focus on landfill operations, is supported by a specialist operations and technical services division made up of 21 engineers who ensure the six landfills WMNZ manages and operates, performs to the highest standard levels. WMNZ's track record includes having the highest performing landfills around New Zealand from a gas capture and leachate management perspective. As a company we have sound risk management, corporate risk and identification and business continuity planning procedures and processes in place.

The services that are provided by WMNZ are essential. They fundamentally underpin the quality of life that all New Zealanders enjoy and are vital in sustainably protecting the future of New Zealand's natural elements. This was confirmed during the recent COVID-19 "lockdowns", where our waste collection and disposal operations were deemed "essential services" under the Health Act 1956. We continued to safely collect, process and dispose of waste across New Zealand throughout the entirety of the lockdown periods, meeting on time and to specified performance standard requirements.

Image: Kerbside collection crews during COVID-19 lockdown.

B) Complied With or Exceeded Expectations

As New Zealand's largest integrated waste services provider, operating a facility with a comprehensive set of consent conditions is part of our normal practices. The Landfill Management Plan ("LMP") will be the primary method for WMNZ to ensure that it maintains compliance with the consent conditions for all the landfills we operate.

To ensure our Landfill Management Plans remains fit for purpose and functions optimally, WMNZ conducts annual internal reviews and engages an Independent Peer Review Panel to assess the performance of the practices and procedures specified in the Landfill Management Plans. WMNZ is committed to holding itself to a high standard in landfill management and completes the review every year, in accordance with consent conditions.

C) Reacting to Poor Performance

We have robust procedures in place for ongoing feedback or reporting of potential issues, regarding operations at our landfill sites from our neighbours. Every call, email or text received from neighbours (whether it is registered as a complaint or not) is recorded and responded to promptly and appropriately.

This gets recorded in our Vault software complaints register, and each complaint or observation goes through a validation process where problems are identified, people assigned to do corrective actions, close outs and recording. We also hold annual meetings at many landfill operations, that usually involve the local community.

D) Customer Care Record

As a commercial enterprise, our success depends entirely upon ensuring our customers are satisfied, whether they are individuals, other businesses, or Council customers. Our track record of achieving very high customer satisfaction scores in regular Council resident surveys is testament to this. In Wellington, where we provide landfill operation and kerbside collection services, our services are consistently rated the highest of all Council services. Within the 2021 HCC Annual Report, kerbside collections received a satisfaction rating of 91% and refuse disposal received a satisfaction rating of **88%**.

E) Responsiveness and Timeliness to Client Requests

WMNZ's management systems and procedures play a vital role in ensuring the quality of our contract works at a local level. All Council contracts are monitored closely and have senior management level commitment including a General Manager and Regional Manager. Supported by a large customer service function, at contract level WMNZ has set KPIs within most contracts that include a measure for responsiveness to requests, for example on the Hutt City Council Kerbside Collections Contract, WMNZ has KPIs for meeting response times that include responding to requests within certain time requirements.

At a company level, customer experience is measured by NPS (Net Promoter Score Surveys) completed by customers contacting our National and Branch Level contract centres, web, telephony, and live chat. NPS is a KPI for our business and is linked to our quality, auditing, and training programmes. WMNZ's NPS score is at an industry leading 16.

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F) Interacting With the Public Daily and/or Project Stakeholder Groups

Our services span the full supply chain. This starts with the collection of waste, through processing to extract valuable recyclables, to the ultimate safe disposal of residual components generated by communities, and commercial and industrial activities, across the public and private sectors.

As the owner and operator of a number of landfills, transfer stations, hazardous waste facilities, recycling facilities and large infrastructure sites across New Zealand, WMNZ has been engaging with our communities for many years and interacts with the public daily, either through use of transfer stations and other disposal facilities, kerbside services or community group involvement. For example, at the Tirohia, Kate Valley and Green Island landfills, WMNZ has strong relationships with a number of community liaison groups and is regularly involved in providing nearby schools visits to landfills as an education initiative.

WMNZ has been engaging with our communities for many years and interacts with the public daily, either through use of transfer stations and other disposal facilities, kerbside services or community group involvement.

G) Management of Environmental Issues, Including Compliance With Consent Conditions

WMNZ has an established track-record in the successful development of large-scale waste infrastructure projects including the regionally-significant Whitford and Redvale landfills in Auckland, and the Kate Valley landfill servicing the majority of the Canterbury region. We are highly experienced in developing landfill infrastructure that is efficient and economic from both a customer and company perspective, whilst also ensuring best practice environmental outcomes.

Image: Spotless Crake, returning to Tiromoana Bush, Kate Valley Landfill.

WMNZ as a company, is strongly committed to environmental sustainability. This is clearly articulated in our "For Future Generations" sustainability strategy, launched in 2018. WMNZ was the first waste services company in New Zealand to develop and publish a detailed sustainability strategy of this type and the first to calculate a carbon footprint reduction plan through Toitū Carbonreduce.

H) Major Project Risks, How these Were Managed and the Parties Involved in the Risk Management

Landfill operations involve management of a wide range of risks, from safety on site for all people working or visiting to environmental management to eliminate risks of long-term harm. These risks are reduced by our ability to draw on our expertise and resource as New Zealand's most experienced waste and landfill operator. Over 70% of New Zealand's entire waste volume to landfill, is successfully managed by WMNZ. In addressing broader reputational or stakeholder risk, we also bring a deep understanding of the Council's processes, requirements for public consultation, openness, and compliance with its environmental and regulatory obligations.

Landfill operations involve management of a wide range of risks, from safety on site for all people working or visiting to environmental management to eliminate risks of long-term harm.

I) Significant Claims and/or Disputes Arising Including How Claim/ Disputes Were Managed and Outcomes

WMNZ has a comprehensive complaints and observations process in place at all our landfills, which involves reaching and responding to every communication we receive from neighbours or other stakeholders regarding our operations, whether those communications are expressed as a complaint, or not.

For example, at the Tirohia landfill site, an issue was raised by a neighbour regarding sound vibration issues experienced by the operation of extraction fans or "blowers" used for one of the flares that burns methane produced by the landfill. WMNZ immediately investigated the cause of the vibration and the blower was turned down immediately after receiving the complaint via remote log on by WMNZ staff. Following the incident, we worked with our suppliers to determine why this had occurred and developed a solution. We also limited flows through the blower while the solution was being developed.

Track Record (20%)

Track Record Reference Projects

Tirohia Landfill & Energy Park

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Track Record Reference Projects

WMNZ provides below three track record reference projects that are directly relevant to the works under this RFT:

Tirohia Landfill and Energy Park

Tirohia, Waikato

Customer Referee:
s7(2)(a)
Senior Resource Officer
Waikato Regional Council
M: s7(2)(a)
Email: s7(2)(a) @waikatoregion.govt.nz

A) Record of Completion:

- On Time
- Within Budget
- To Specified Performance Targets

The Tirohia Landfill and Energy Park has received waste from as far north as Auckland to the north, and as far south as Gisborne, since its creation from a century old quarry in 2001, and much has changed since WMNZ began operating Tirohia in 2016.

Our landfill operation has strong policies and business operational procedures in place, our annual standard costs do not significantly fluctuate from year to year and are consistent with the annual volumes and tonnes received. Our methodology gives the Tirohia Landfill and Energy Park the ability to accurately budget and forecast our annual operations and offers our customers a viable service and product for the disposal of refuse and waste. Tirohia disposal costs are driven by annual operational volume and tonne assumptions. The government levy and ETS charges are passed on to the customer at cost. Disposal prices over the last three years has been consistent with either minimal or no price increase.

Our methodology gives the Tirohia Landfill and Energy Park the ability to accurately budget and forecast our annual operations and offers our customers a viable service and product for the disposal of refuse and waste.

WMNZ have delivered and maintained landfill service compliance for the Thames Coromandel, Hauraki and Matamata Piako District Councils since the landfill opened in 2001. KPIs have not been in place for these contracts; however, WMNZ would welcome their inclusion in contracts going forward. To date we have supplied daily, weekly, and monthly weighbridge information and sent out invoicing each month. We work closely with each Council and Council contractor to maintain a consistent quality of service, and ensure acceptance policies and health, safety, environmental and quality management requirements are followed.

B) Complied With or Exceeded Expectations

WMNZ receives waste from the three local councils identified above and has received no complaints from any of them. We also receive waste from other councils through collection contracts managed by WMNZ, such as Rotorua, Hamilton, and Whakatane. Since WMNZ has operated the landfill, it has never closed or disrupted operations receiving waste. We managed to keep this critical infrastructure operational, accepting waste from a vast and diverse region. Managing the various aspects of operations, including capturing, and destroying landfill gas, maintaining two 1MW generators and managing about 20 FTEs relies on tested standard operation plans (SOPs), detailed contingency plans and a well-managed team.

C) Reacting to Poor Performance

WMNZ has robust procedures in place for receiving ongoing feedback and the reporting of potential issues raised by our neighbours regarding operations at the Tirohia site. Every call, email or text received (whether registered as a complaint or not) is recorded and responded to promptly and appropriately. The Landfill Manager personally keeps in touch with neighbours and has a good relationship with many of the landfill's closest neighbours. For example, we follow a proven procedure to investigate complaints. The majority have been related to odour, and get responded to by following a procedure of confirming the frequency of the issue and the intensity of the odour. The results are relayed to Council and an appropriate reply detailing response measures to the neighbour.

We use internal and external audits to monitor our consent processes, such as health and safety and environmental. When an issue arises, we address it by adding the action item through our IT system, The Vault, to ensure it gets assigned and resolved in an appropriate timeframe.

We use internal and external audits to monitor our consent processes, such as health and safety and environmental.

D) Customer Care Record

A number of neighbours have advised that they experience odour from time to time. Some of the neighbours also stated that they hear the noise of landfill plant more often than in previous years, including early in the morning, due to the high elevation of the current Phase B landfill. WMNZ acknowledged these concerns and encouraged the neighbours

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to report any instances of odour or noise to us straight away so that WMNZ could promptly investigate, determine the source and undertake appropriate remedial actions (should these be required).

The landfill does not operate an on-site public transfer station. As Tirohia is not open to the public, this landfill does not have a traditional customer care record. We discuss how we address issues arising from adjacent properties as a means of demonstrating our commitment to encouraging good relations with the public.

E) Responsiveness and Timeliness to Client Requests

WMNZ has robust procedures in place for ongoing feedback or reporting of potential issues regarding operations at the Tirohia site from our neighbours.

Every call, email or text received from neighbours (whether it is registered as a complaint or not) is recorded and responded to promptly and appropriately.

This gets recorded in our Vault software complaints register, and each complaint goes through a validation process where problems are identified, people assigned to do corrective actions, close outs and recording. We also have annual meetings, to which the local community is invited. The most recent neighbours' meeting was held in December 2020.

Every call, email or text received from neighbours (whether it is registered as a complaint or not) is recorded and responded to promptly and appropriately.

F) Interacting With the Public Daily and/or Project Stakeholder Groups

For safety reasons, public access is restricted at Tirohia. We host school groups, including the polytechnic in Tauranga, as a means of liaising with the community and addressing the superannuated negative connotations of a landfill. Students enjoy learning the ways a modern, gas-capture facility like Tirohia can convert waste to clean energy.

G) Management of Environmental Issues, Including Compliance With Consent Conditions

In 1912 the Tirohia Quarry Company started quarry operations at Tirohia. In 1952, HG Leach & Co Ltd (HGL) purchased the quarry and undertook quarrying activities, until the end of 2016 when the site was sold to WMNZ. The landfill's operations are compliant with the WMNZ Environmental Policy dated 2016.

WMNZ holds nine resource consents granted by the Waikato Regional Council (WRC) in relation to the Tirohia landfill. WRC carries out a compliance audit of these consents every year.

H) Major Project Risks, How these Were Managed and the Parties Involved in the Risk Management

Tirohia Landfill management actively engages with employees and contractors to minimise risk and continually improves health and safety. Numerous initiatives have been introduced including near miss reporting and safety interactions recorded in our Vault software system. We have also focused on our biggest risks on site which are collisions, and vehicle and pedestrian interaction. Initiatives have included:

- Implementing a 5m rule at all times, between vehicles, personnel and pedestrians.
- Contractors and delivery vehicles must have CB radios and towing eyes.
- Auditing, reporting and refusal of entry on substandard bins.
- Only permitting commercial vehicles that can tip rubbish off.
- Only approved handlers are permitted to offload asbestos contaminated material. (ACM) with the aid of a forklift to reduce exposure to our operators.

All our staff follow and must sign off on strict work instructions and risk assessments.

On a monthly basis, we prepare, submit and review health and safety reports internally. We also submit environmental reports to Waikato Regional Council to confirm we are meeting our consent requirements. These are audited each year to ensure we are adhering to strict environmental standards and Ministry for the Environment, and National Environmental Standards guidelines.

I) Significant Claims and/or Disputes Arising Including How Claim/ Disputes Were Managed and Outcomes

Since WMNZ has taken over operations, we are not aware of any claims or disputes that have arisen.

J) For a Strategic Partnership:

Success in utilising collaborative contract management mechanisms

Tirohia is an independent facility, and waste comes from multiple sources within the region. We receive waste from various councils outside of formal contracts. Therefore, we have limited record for managing collaborative contract management mechanisms for this site. We work collaboratively with private and public entities and continue to receive waste from expired contracts by maintaining a similar level of service.

WMNZ ran the HCC contract as a Class A landfill, which resulted in being the destination for some of WMNZ's Hamilton's collection contracts.

Working collaboratively with local authority clients and stakeholders on the delivery and continuous improvement of landfill operations

The Tirohia Landfill and Energy Park is estimated to produce around 1800m³/hr of gas, and we are at the forefront in terms of gas capture and destruction. Our system captures, then conditions the gas and sends it to flare or power generation. The landfill increased its

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gas destruction efficiency from 38% in 2017, to 54% in 2018, and to 90% in 2019.

As part of the Emissions Trading Scheme (ETS) we track all our gas destruction and this is independently verified at year end. WMNZ carries the ETS liability, and we are dedicated to keeping the liability risk as low as possible, to give the Councils the best possible benefit.

Key business objectives for the Tenderer in the Wellington Region and how these will be achieved or supported through the strategic partnership

WMNZ experience with the Tirohia landfill in developing landfill infrastructure that is efficient and economic from both a customer and company perspective, whilst also ensuring best practice environmental outcomes can be used to achieve similar efficiencies for the Silverstream landfill and the wider Wellington region. The operating methodologies for Tirohia were developed by the same specialist WMNZ landfill engineers proposed for Silverstream and are a key benefit for supporting the strategic partnership going into the new contract and the new development phases.

The operating methodologies for Tirohia were developed by the same specialist WMNZ landfill engineers proposed for Silverstream.

K) Achieving waste reduction and broader sustainability on similar operations including reducing energy use, low impact water management and emissions reductions

We monitor our use of resources with the aim of identifying areas of improvement, such as using the clean energy we generate, offsetting carbon credits, observing a sustainability budget for carbon, and producing annual carbon emissions reports.

We run the entire plant on a SCADA system which enables us to remotely log on, and start and stop and change settings in the plant. We also provide a free electric car charging facility at the site office.

L) Introducing innovation to address cost and increasing the social, environmental and cultural benefits of similar operations

Since acquiring the Tirohia landfill site in 2016, WMNZ has endeavoured to become an active member of the local community and create opportunities to enhance community wellbeing. Initiatives have included establishing a Community Trust at Tirohia and a Community Liaison Group, open to neighbours and local stakeholders to join.

WMNZ has invested in significant improvements to the existing landfill operations, to the benefit of the environment and local community. These significant improvements made to the operation of the Tirohia landfill following the acquisition by WMNZ, are good examples of our approach to ensuring operational excellence in practice. Initiatives include:

- Leachate – We improved leachate management practices at the landfill by increasing our capacity to dispose of leachate off-site, through the expansion of our disposal network to include additional off-site disposal sites (including through our internal branch, WMNZ Technical Services).
- LFG capture – We optimised the layout and tuning process for the gas field, which is now tuned weekly to maximise LFG capture. Through these improvements, we raised the LFG capture from approximately 38% in 2016, when WMNZ first took over the site, to approximately 90% in 2020.
- Stormwater ponds – We increased the storage volume of sediment Pond B, which we identified was undersized given the scale of the Phase B operation. We also desilted the bottom ponds, which had not been done in the 20 years of landfilling operations. Desilting significantly improves the performance of sediment ponds.
- Renewable Energy Centre – We installed a brand-new power 1MW electricity generator at the gas plant in July 2020 and completely redesigned and constructed the Renewable Energy Centre at the Tirohia site in 2018. The new generator can produce 1MW of energy on a continuous basis.

Modernising Tirohia sees massive drop in carbon emissions

Thanks to our investment and expertise, 90% of all methane gas at Tirohia is captured and destroyed. The site also now has the capacity to convert this gas into energy to feed into the national grid.

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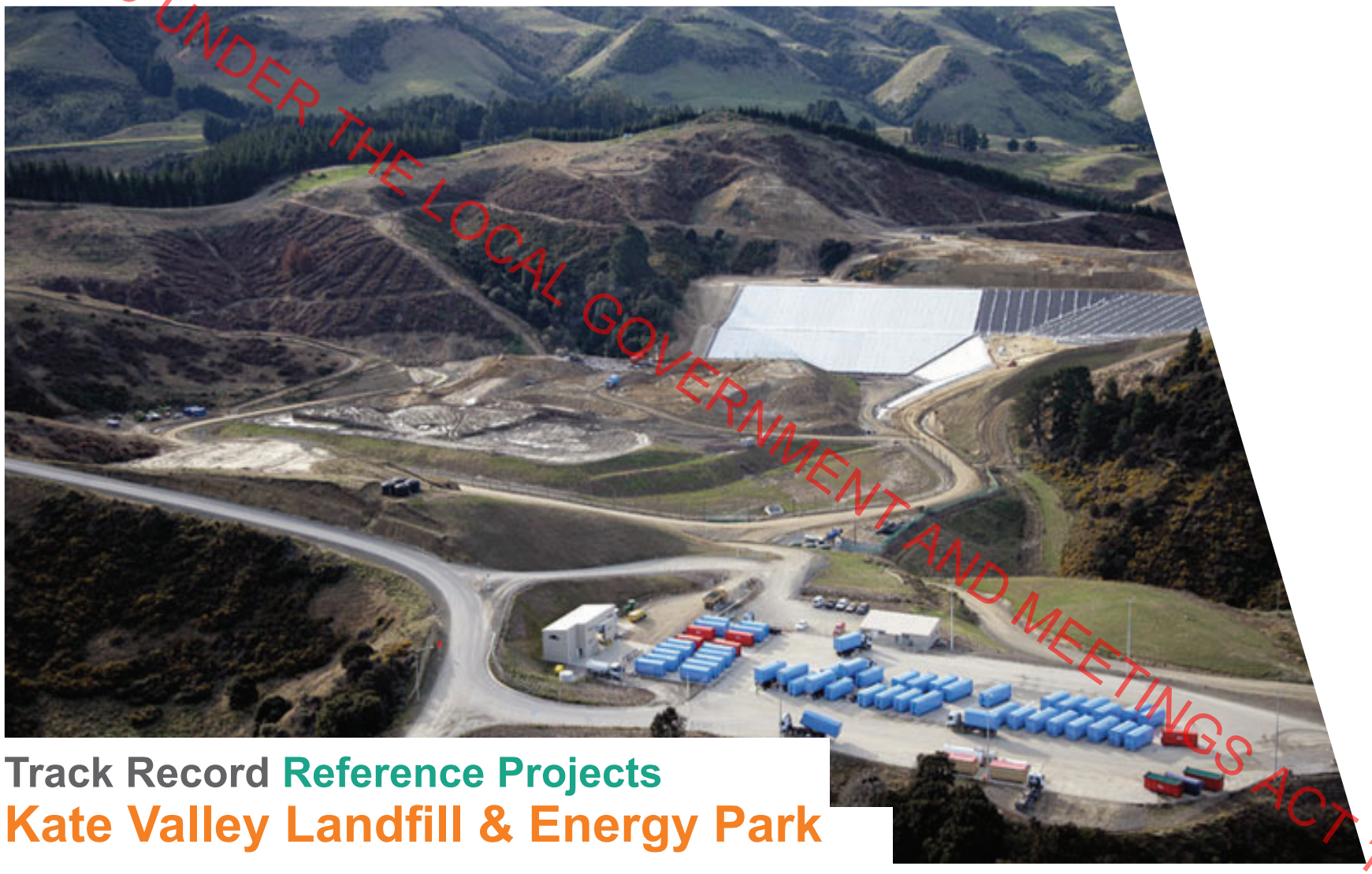
Track Record (20%)



Track Record Reference Projects
Kate Valley Landfill & Energy Park

Kate Valley Landfill and Energy Park
Teviotdale, Canterbury

Customer Referee:
s7(2)(a)
Solid Waste Manager
Waimakariri District Council
M: s7(2)(a)
Email: s7(2)(a) @wmk.govt.nz

A) Record of Completion:
- On Time
- Within Budget
- To Specified Performance Targets

Transwaste Canterbury Limited (TCL), is a Public/Private/Partnership (PPP) between WMNZ (50%) and five local authorities in the region (50%) - Ashburton District Council, Christchurch City Council, Hurunui District Council, Selwyn District Council, and Waimakariri District Council. TCL commissioned WMNZ, through its Canterbury Waste Services (CWS) division, to manage the consenting, design and construction of the facility. CWS also now operates the Kate Valley landfill for TCL under a separate management and operation contract.

This contract included the original site purchase, consenting, design and construction management of multiple cells for the Kate Valley landfill, and associated infrastructure, and operation of the landfill from its opening day on 9 June 2005 for its consented life to June 2040.

As of April 2022, approximately $96.7m has been spent on land procurement, initial site and cell development, and subsequent site and cell development. Over the balance of the 18 years of life of the existing consented landfill, another approximately $60m is expected to be spent on capital works. The initial site and cell development cost approximately $30m. WMNZ also manages all capital works for TCL.

The landfill operation has strong policy and business operational procedures; our annual standard costs do not significantly fluctuate from year to year and are consistent with the annual volumes and tonnes received.

The landfill operation has strong policy and business operational procedures; our annual standard costs do not significantly fluctuate from year to year and are consistent with the annual volumes and tonnes received.

B) Complied With or Exceeded Expectations

Kate Valley operates under set KPIs that are directly reflected under the Transwaste Canterbury partnership. A Statement of Intent (SOI) gets published annually and sets out shareholder expectations, such as being open 99% of the time. TCL has always met KPIs since it became operational in 2005.

The TCL partnership has been recognised by The Auditor-General and the NZ Council for Infrastructure Development as one of the best examples of a successful PPP in New Zealand. Kate Valley continues to operate profitably, returning dividends to all of the Council PPP partners each year.

C) Reacting to Poor Performance

The single biggest issue through the years has been odour control, though it has been considerably mitigated since 2016. This issue was addressed when TCL improved daily and intermediate cover and installed odour suppression equipment on the perimeter of the landfill.

D) Customer Care Record

The Kate Valley Landfill services the entire Canterbury region and is fed by a network of 16 transfer stations that send all of their waste to Kate Valley. The landfill does not operate an on-site public transfer station.

Landfill management regularly consults with shareholder transfer station operators.

The Kate Valley Community Liaison Group (CLG) was set up to enable regular and effective communication between residents in the Waipara-Omihi area, adjoining landowners and WMNZ/Transwaste. The Group consists of three representatives of property owners in the Waipara-Omihi area, two representatives of property owners along Mt Cass Road and one representative from Transwaste. The Group meets on a quarterly basis to discuss any community or cultural concerns relating to the landfill and receives updates on the development and operation of the landfill, including monitoring reports on issues such as landfill noise and odours.

The Kate Valley Community Liaison Group (CLG) was set up to enable regular and effective communication between residents in the Waipara-Omihi area, adjoining landowners and WMNZ/Transwaste.

E) Responsiveness and Timeliness to Client Requests

Information is discussed and where relevant a reply is emailed to the customer. Enquiries

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about general and special waste disposal are handled, usually on the same day, and an emailed response is sent to the customer if required.

Regular tours of Kate Valley are enjoyed by external groups which range from school groups through to Probus groups. TCL regularly hosts shareholders and corporate clients who have a focus on sustainability practices and want to confirm that the landfill's operations meet expectations.

F) Interacting With the Public Daily and/or Project Stakeholder Groups

WMNZ and Transwaste place high priority on community engagement. Before the landfill opened, consultation commenced with Tangata Whenua and local residents, and continues to this day. In addition to formal engagement activities, WMNZ and Transwaste encourage schools, educational institutions, community groups and organisations to visit the landfill to experience for themselves how a modern landfill operates and learn more about how waste is safely managed in Canterbury. WMNZ and Transwaste are also giving back to the local community through the Kate Valley Landfill Community Trust, which supports charitable and community activities.

G) Management of Environmental Issues, Including Compliance With Consent Conditions

The Kate Valley landfill has a blemish free environmental compliance record and is widely regarded as having set a new standard in environmental protection for landfills in New Zealand. The landfill is located centrally on what was part of Tiromoana Station, a farm originally purchased and operated by TCL. The farming operation was subsequently sold off with approximately 1,000ha remaining in TLC's ownership (including the landfill and surrounding buffer zone). The retained land holding includes landfill associated facilities and buildings, access roads and tracks, water supply and sedimentation ponds, landscape plantings, forestry activities, and the 410ha QEII covenanted Tiromoana Bush scenic reserve and public walkways.

Image: Tiromoana Walkway, part of the Tiromoana Bush Regeneration Project at Kate Valley.

The Kate Valley project required a wide range of capability in RMA consent processes, landfill design, landfill and civil infrastructure construction, landfill gas collection, power generation, resource recovery plant and RTS design, landfill plant procurement, and landfill operation. The project also highlights the experience and expertise in the establishment and operation of a new modern fully engineered landfill, then the full and complete management of ongoing daily operations.

H) Major Project Risks, How these Were Managed and the Parties Involved in the Risk Management

A structured process is followed for new projects to ensure risks are neutralised or minimised. Following completion of design work by our consultant, Tonkin & Taylor, there is a meeting to discuss Safety In Design (SID). This meeting includes the designer, OATS and the Kate Valley construction teams who review the plans collaboratively. This ensures any inadequacies are resolved, particularly from a health and safety perspective. This also reduces the possibility of operational shortcomings.

I) Significant Claims and/or Disputes Arising Including How Claim/ Disputes Were Managed and Outcomes

During the operational and construction phases of the landfill since 2005, there have been no significant disputes or claims. Cost overruns have occasionally occurred due to force majeure events, provisions for which are covered under contractual clauses.

J) For a Strategic Partnership:

Success in utilising collaborative contract management mechanisms

This operation is widely regarded as one of the best in Australasia, due to the successful long-term collaborative approach between all of the JV partners.

The success of the Kate Valley landfill JV won the IPENZ Engineering Excellence Award in 2006 and the ACENZ Gold Award for Engineering Excellence in 2007. CWS has also won two Champion Canterbury Awards, in 2007 and 2010.

The Kate Valley landfill is an excellent example of an innovative partnership that brings together the councils of Canterbury and the waste management expertise of the private sector in a pioneering joint venture. In 1996, Canterbury councils formed a joint committee to plan for managing the region's waste. The councils recognised that by working as a collective, it would be possible to develop a modern well-engineered landfill to the highest international standards and provide affordable and environmentally responsible waste management for the future. This was the first time the Canterbury councils had worked together to solve a region-wide issue.

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Working collaboratively with local authority clients and stakeholders on the delivery and continuous improvement of landfill operations

The Kate Valley landfill demonstrates a highly regarded regional asset, managed as a joint venture that has worked very hard to provide the Canterbury region with the degree of infrastructure it requires over the next 20 years - and beyond. Kate Valley is a world class landfill that exemplifies how a modern landfill should operate.

Key business objectives for the Tenderer in the Wellington Region and how these will be achieved or supported through the strategic partnership

Whilst Kate Valley has no objectives for the Wellington Region, we aim to provide a modern waste disposal facility for the Canterbury region that is environmentally, safely and efficiently operated. Kate Valley is the primary regional landfill for Canterbury. This objective relies on the strategic partnership with TCL and its council shareholders. The experience WMNZ has gained from this collaborative joint venture partnership approach to operating and managing the landfill with Kate Valley, can be applied to the Silverstream landfill and any other strategic partnership for the Wellington region.

K) Achieving waste reduction and broader sustainability on similar operations including reducing energy use, low impact water management and emissions reductions

Similar to other WMNZ facilities, we conduct monthly carbon emissions reports, comparing to established base lines.

Gas and electricity generation

Decomposing organic material in the landfill produces gas, predominantly methane. To prevent methane, which is a greenhouse gas, escaping into the environment, it is collected by a network of pipes and used as fuel to drive generators to produce electricity for the national power grid. At the end of 2014, two generators were installed producing about 2MW of electricity. Two more generators installed in June 2019 increased the electricity production to 3MW.

L) Introducing innovation to address cost and increasing the social, environmental and cultural benefits of similar operations

An example of introducing innovation at the Kate Valley landfill is the containerised transport approach.

Waste is transported to the Kate Valley landfill in sealed containerised bins on truck and trailer combination vehicles. This has many benefits for the community, safety and operation of the landfill. Sealed containers prevent waste escaping in transit and littering the roadside. Containers are only collected from shareholder councils' refuse transfer stations when they are full, reducing unnecessary journeys and ensuring efficient use of trucks and containers.

Arriving at the landfill, authorised waste haulage vehicles pass over a weighbridge that records their load including date, time, origin, truck details and weight. We record vehicle movements to ensure compliance with resource consents.

From the weighbridge, vehicles proceed to a container park located adjacent to the landfill. Trucks exchange full containers for empty ones, without having to enter the landfill or leave the sealed road surface. Keeping haulage vehicles separate from the rest of the landfill operations, yields benefits that include reduced wear and tear, cleanliness, and reduced waiting time. The system avoids disruptions at transfer stations when the landfill is closed due to high winds or very wet conditions, as trucks can still collect and deliver full containers.

Specialised off-road 8WD tipper trucks then collect and unload the full containers at the landfill. The waste is spread out, inspected, and compacted using a 55-tonne compacter to ensure maximum density. These dedicated vehicles, shuttling waste containers within the landfill, offer a much safer and more efficient method than having every vehicle unloading waste in the landfill.

Local soils are spread daily over compacted waste to prevent odour, rainwater infiltration, windblown litter and scavenging from birds and rodents. Regular monitoring reveals few pest problems, and no seagulls, despite the proximity to the coast.

Kate Valley Containerised Transport Approach

Waste is transported to the Kate Valley landfill in sealed containerised bins on truck and trailer combination vehicles.

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Track Record (20%)

Track Record Reference Projects
Silverstream Landfill

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Silverstream Landfill

Stokes Valley, Lower Hutt

Customer Referee:
s7(2)(a)
Manager, Water and Waste
Porirua City Council
Tel: s7(2)(a) Mob: s7(2)(a)
Email: s7(2)(a) @poriruacity.govt.nz

A) Record of Completion:

- On Time
- Within Budget
- To Specified Performance Targets

Silverstream Landfill accepts approximately 120,000 tonnes each year. The Silverstream landfill contract has a lump sum value of $2.5m per annum, excluding unscheduled work as instructed by the engineers. Any additional unscheduled work is based on agreed machine and labour hours.

WMNZ has delivered services to a very high standard in a challenging geographical environment. An example of this was the building of a landfill access ramp for commercial vehicles which was constructed in 2020 on time to enable capital works to proceed unhindered.

The Landfill Manager provides HCC with a monthly compliance report to provide Council that WMNZ is meeting all contractual obligations for operating the landfill.

WMNZ has delivered services to a very high standard in a challenging geographical environment.

B) Complied With or Exceeded Expectations

The landfill has had very low levels of customer complaints. The operation is regularly audited by Tonkin & Taylor engineers for HCC in addition to resource consent audits for Greater Wellington Regional Council. Outcomes from the audits have consistently been favourable with compliance and meeting expectations.

C) Reacting to Poor Performance

The landfill has only received one issue since 1998. The issue was in relation to landfill odour, received from a resident complaint in 2017. Greater Wellington Regional Council visited the site and advised that the landfill cover was marginal and WMNZ was asked to reduce the size of the refuse base by placing additional cover. This was completed within two-days of notification of the issue. Upon investigation it was found that the odour was attributed to landfill gas and not refuse odour.

D) Customer Care Record

HCC has conducted customer care surveys for the landfill. The results of the surveys found that residents were happy with the service provided at the landfill. The team that operates the landfill has been together for a long time and has an excellent philosophy for ensuring it delivers great service to residents using the landfill.

E) Responsiveness and Timeliness to Client Requests

At the Silverstream Landfill, there is a big emphasis on responses to customer/client and public relations. WMNZ takes pride in developing excellent customer/client relationships by open and honest dialogue.

The landfill operates under set KPIs for response times - Oral responses within 24 hours of receipt and written responses with 48 hours.

Public Relations - WMNZ and staff are required to maintain a high standard of public relations. All dealings with landfill customers and visitors must be conducted in a courteous, helpful and professional manner through all public interfacing roles at the kiosk and on-site transfer station.

F) Interacting With the Public Daily and/or Project Stakeholder Groups

The landfill has a number of customer touch-points interfacing with WMNZ staff. The weighbridge is operated by four part-time staff operators. They are the faces and team who welcome residents into the landfill, guide and direct them on where to go and provide resource recovery advice. When users pass over the weighbridge and head to the transfer station, they are greeted by staff members who guide users on where to go, ensuring safety. The Landfill Manager meets with HCC and Tonkin & Taylor quarterly for heads of agreement and other stakeholder meetings. The Landfill Manager is the first point of contact for managing relationships with HCC and Tonkin & Taylor and has a very good working relationship with them, that has been built up over the years of operating the site.

Image: Silverstream Landfill Kiosk Attendant s7(2)(a)

HCC also arranges school visits to the site, the scrap metal facility and Earthlink as an educational initiative.

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G) Management of Environmental Issues, Including Compliance With Consent Conditions

WMNZ has a comprehensive Silverstream Landfill Safety Management Plan detailing responsibilities and actions for each of the associated site entities in ensuring that the landfill operates to consent conditions. This document has been welcomed by HCC.

The site operates under a number of resource consents which WMNZ is required to report on. The Landfill Manager provides a monthly Compliance Report to HCC and Tonkin & Taylor that details compliance.

H) Major Project Risks, How these Were Managed and the Parties Involved in the Risk Management

The landfill is in a very challenging geographical environment. The Landfill Manager has discussions with Tonkin & Taylor engineers prior to the commencement of any work which involves risk assessment. An example of this was when WMNZ engaged a subcontractor to clean out the silt ponds. The ponds were found to contain a species of eel, prior to commencement of cleaning them out and were captured and relocated. Risks involved excavators, and loaded ADT dump trucks with watery material travelling up a steep landfill access road. WMNZ evaluated the risks along with the subcontractor and the engineer, and developed a safe methodology so works could commence.

I) Significant Claims and/or Disputes Arising Including How Claim/Disputes Were Managed and Outcomes

There has been one claim since 1998. The claim was in relation to the purchase of a pipe angle which was found to be incorrect. The designer and the engineer were at odds with how the design was fabricated and the engineers advised that WMNZ was responsible for checking the design and had to have the angle modified at cost. WMNZ accepted the fault and moved on to complete the project on time.

J) For a Strategic Partnership:

Success in utilising collaborative contract management mechanisms

The contractual relationship and partnership approach between WMNZ, HCC and Tonkin & Taylor have been effective since their inception in 2001 and continue to evolve. Over the years WMNZ has been able to advance our operational services to meet the changing needs of Council, while maintaining the operations within a framework of industry best practices.

The contractual relationship and partnership approach between WMNZ, HCC and Tonkin & Taylor have been effective since their inception in 2001 and continue to evolve.

An example of this is the continual roll-over of the contract since 1998, advancement of the landfill and various aspects from kiosk system upgrades, pricing upgrades and working with the various contractors involved in construction of the capital works each year.

Working collaboratively with local authority clients and stakeholders on the delivery and continuous improvement of landfill operations

There is a close working relationship between WMNZ, HCC representatives and the landfill's engineers Tonkin & Taylor to ensure this Class A landfill is operated within its resource consents. Monthly audits are conducted to ensure full compliance.

WMNZ has been a very adaptable and flexible operator and works in partnership with HCC and Tonkin & Taylor on continuous improvement programmes. Several notable improvement projects over the past five years have included:

- The current transfer station improvements and the new weighbridge software system.
- Operated and still operating under Covid-19 restrictions.
- Managing large quantities of special waste that have been accepted from other regions.

Image: Silverstream Landfill On-site Transfer Station.

Key business objectives for the Tenderer in the Wellington Region and how these will be achieved or supported through the strategic partnership

The key business objective for WMNZ and the Silverstream landfill contract is to work towards providing a resource recovery facility, either at the landfill or in the Wellington region, that will support Council's waste minimisation targets and broader social outcomes, and will provide greater opportunities for the community to be involved - for example Earthlink or the Zero Waste Network.

WMNZ will be striving to ensure the continuation of a safe and effective operation of the Class A Silverstream landfill for staff and landfill users, and provide an operating method

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that will see a reduction in carbon emissions.

K) Achieving waste reduction and broader sustainability on similar operations including reducing energy use, low impact water management and emissions reductions

Silverstream Landfill conducts a monthly carbon emissions report to the Lower North Island Divisional Sustainability Champion and monitors fuel usage of all landfill machines. There are set targets within the Sustainability Plan for the division that the Silverstream Landfill Operations team reports on.

There is capability on the site to implement an electric vehicle charging station for light vehicles. During the summer months, water usage is strictly monitored for dust control and toolbox talks with staff include providing information for reducing energy i.e. turning off lights and appliances at the end of the day.

There is capability on the site to implement an electric vehicle charging station for light vehicles.

L) Introducing innovation to address cost and increasing the social, environmental and cultural benefits of similar operations

The Silverstream Landfill is a Class 1 landfill. This designation means it meets the highest level of environmental protection. There are a limited number of Class 1 landfills in New Zealand and amongst these there exists a wide range of environmental impacts. The Silverstream landfill operates at the top end of landfill gas capture and leachate management controls. This performance level places it well above the levels achieved by the other two operating Class 1 landfills in the Wellington region.

The Silverstream Landfill is a Class 1 landfill. This designation means it meets the highest level of environmental protection.

With the increasing focus on waste minimisation, the importance of having a high quality environmentally sound option for the safe disposal of residual waste is becoming increasingly important. The environmental and operational controls in place at the Silverstream landfill, mean that it is ideally suited to fulfill this role now and in the future in support of improved environmental outcomes.

Key personnel currently on site, have been running the Silverstream Landfill for more than 20 years, delivering improved outcomes for all stakeholders as industry best practice is continuously applied. Over the years, WMNZ has been able to advance our operational methodology to meet the needs of Council, while maintaining the operations within a framework of industry best practices - for example:

- Introduced a larger compactor to more efficiently move and place waste. This machine also provides a higher compaction rate, resulting in an increased utilisation of available airspace.
- Worked with The Akina Foundation which ran a workshop with staff from WMNZ, Earthlink, Tonkin & Taylor and HCC to better understand the positive impact that the landfill is having, and the further opportunities that exist to improve this in the future.
- Measuring our carbon footprint monthly, to manage emissions including monitoring fuel usage of landfill machines and improving efficiency.
- The Landfill is filled safely with risks mitigated and fewer resource consent breaches – there have been no resource consent breaches since 1998.

The Falcon has landed at Silverstream Landfill

The kārearea has become so comfortable with the comings and goings at Silverstream that it makes itself at home and has been known to perch on top of utes, on the ADT (articulated dump truck) and once even on the excavator boom while the machine engine was running.

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Tō tātou tāone
Our city

Relevant Experience (15%)

Attachment C | Non-Price Attribute Evaluation Criteria

(B) COMPARATIVE CRITERIA

Image: Landfill Engineer, Redvale Landfill and Energy Park, Auckland

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Relevant Experience (15%)

Relevant Experience
Key Staff Involved

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A) Key Staff for the Contract and Management Systems

Proposed Key Staff

With a focus on safety, Council reputation, efficiency across operations and maximising recovery of materials, and minimising carbon, WMNZ brings a highly knowledgeable team. We have in-depth experience and knowhow of our drivers, the challenges, and issues critical to the successful delivery of resource recovery and supporting services. Most of our proposed team are already working at Silverstream, delivering outstanding results for HCC.

Leading the team will be our proposed Contractor's Representative, s7(2)(a), General Manager, Lower North Island. He oversees all our Council contracts in this area, enabling him to provide strategic and informed oversight into your requirements and the opportunities and added value we can offer in the responsible disposal of solid waste for HCC communities. While s7(2)(a) won't be involved in the day-to-day delivery, he is happy to attend governance meetings as required to offer insight and discuss any challenges that may arise.

Responsibility for the timely and cost-effective delivery of these contracts will be s7(2)(a) Wellington Regional Manager, as Contract Manager. s7(2)(a) has established relationships with personnel from HCC and contractors delivering to Silverstream, and has proven capability in the areas of health and safety, environmental and quality performance.

s7(2)(a) will be Landfill Operations Manager; another person with whom HCC will be very familiar. s7(2)(a) runs a very qualified, capable, and experienced team with rigid protocols to protect all personnel, contractors, plant and equipment, and the Silverstream Landfill site and surrounding environment.

s7(2)(a) and s7(2)(a) will be your key points of contact depending on the activity, and they will be responsible for rapid issue resolution. s7(2)(a) is available as an escalation point if required along with support from the national corporate and operations teams as required. Ready resources are available if required, for example in an emergency.

s7(2)(a) as Landfill Team Leader, also reporting to s7(2)(a) will use his 30 years' experience in management and plant operations in the waste management sector to ensure the smooth day-to-day management of personnel and contractors.

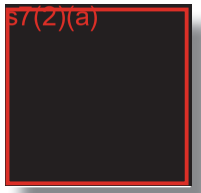
There will be a team allocated to Weighbridge & Customer Service, as highlighted on our organisational chart, overseeing the weighbridge reporting and utilising data to produce accurate reporting and invoicing. This team has excellent relationships with customers and an in-depth knowledge of Council requirements.

HSEQ Manager, s7(2)(a), is our Head of Safety and Risk. Working closely with s7(2)(a) will regularly review the Risk Register and mitigation measures, operational performance and reporting procedures, and will provide updated health, safety, quality, and environmental management plans going into the new contract. s7(2)(a) is extensively experienced in international best practice HSEQ systems, policies and procedures applied to waste management activities. Supporting s7(2)(a) and the operational team reporting to s7(2)(a) will be a local Compliance Co-ordinator. The local Compliance Coordinator will be a very focused role on ensuring all local authority prescribed as well as WMNZ, HSEQ, KPI and administration requirements are followed.

Sustainability and Innovation Manager s7(2)(a), is our head of Sustainability. Working closely with HCC and the Silverstream landfill team, s7(2)(a) will regularly review carbon reduction targets for the landfill including providing guidance and assistance with carbon emission reporting.

Supporting our team with the tran perat ogy and decarbonisation initiatives will be s7(2)(a) and s7(2)(a) Both s7(2)(a) and s7(2)(a) are specialist landfill experts and will be available to provide input into safe operation methodologies, as well as advice for future decarbonisation initiatives for plant and equipment.

The Silverstream Landfill contract will be self-performed by WMNZ. Below we provide highlighted skills and responsibilities for our named key roles and an organisational chart on page 33. Detailed CVs for our named key roles, that further highlight our teams' skills and experience, have been included with the completed Attachment H 'Key personnel Listing Form in Appendix H.



Contractors Representative |
s7(2)(a)
General Manager, Lower North Island

s7(2)(a) is responsible for the operation and performance of WMNZ's Lower North Island region. As Contractor's Representative for this contract, s7(2)(a) will provide critical high-level support and oversight for the contract negotiations, throughout the implementation, and then the on-going operation and delivery of the services.

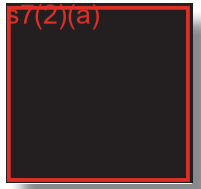
As General Manager - Lower North Island, s7(2)(a) is responsible for the sales and operations of WMNZ across the Lower North Island, which spans the Waikato and Bay of Plenty regions in the north, through to Wellington in south. This role includes overseeing WMNZ's operations at the Tirohia and Silverstream Landfills, as well as operations at our other

major facilities across the Lower North Island, including a network of recycle materials recovery plants, resource recovery operations, transfer stations, and our waste and recycle collections' business.

s7(2)(a) holds an MBA from the Mt Elisa Business School, is a member of the Institute of Directors, a Board member of WasteMINZ (the leading New Zealand professional body for the waste management sector) and a member of the Government's Waste Advisory Board.

s7(2)(a) previous experience includes 17 years in the construction materials sector, primarily working with quarry operations and ready-mix concrete. s7(2)(a) was actively involved in managing the operation and environmental compliance of many large-scale, long-term operations, as well as numerous resource consent processes to expand or start new operations. This has provided him with a high level of awareness of the multiple stakeholders that have interest in long term land use infrastructure. The requirement to constantly be working to apply best practice to these operations, so as to minimise any impacts on those stakeholders, and to retain the ability to operate critical infrastructure for Aotearoa New Zealand, now forms David's fundamental approach to overseeing the operation of these sites.

s7(2)(a) holds full management oversight of all Council contracts and will bring a positive, pragmatic, and collaborative approach to relationships with HCC.

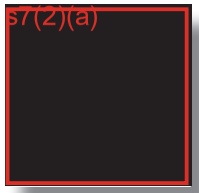


Contract Manager | s7(2)(a)

Regional Manager, Wellington

s7(2)(a) will be our Contract Manager, providing the senior point of contact for Council. s7(2)(a) has extensive knowledge and experience with managing waste and recycling solutions, and key customer contract management experience. As Wellington Regional Manager, s7(2)(a) is responsible for all waste operations for WMNZ's Wellington sites, including the Silverstream Landfill and reports directly to s7(2)(a) (General Manager – Lower North Island). s7(2)(a) has strong leadership skills, and a long length of history with WMNZ.

s7(2)(a) will also be a contributing member of the Governance Group, providing direction and high-level consultation to achieve best outcomes for this contract. This will include establishing terms of reference and strategic focus, ensuring a productive partnership with Council is maintained.



Landfill Operations Manager | s7(2)(a)

Silverstream Landfill Manager, Silverstream

s7(2)(a) will be our Landfill Operations Manager, providing the senior point of contact for Council. As our Landfill Operations Manager, s7(2)(a) has a proven and successful local track record, having been in this role for the past 20-years at Silverstream.

He will be involved in overall management of the contract, ensuring service, reporting, customer liaison, health, safety and environmental and management commitments are all met to the highest standard. s7(2)(a) will focus the complete performance of all operations, the status of the relationship, maintaining focus on HCC's waste minimisation goals, and driving continual improvement. He will have overall responsibility for the implementation and on-going programming and delivery of this contract for HCC including working with the various engineers involved in the new development phases of the landfill. s7(2)(a) will ensure a consistently high standard of service, delivered cost effectively that will meet the needs of HCC throughout the term of the contract. He will have an overview of the entire operation working collaboratively with Council and supporting the contract operational leads, s7(2)(a) s7(2)(a)

Landfill and Transfer Station Supervisor | s7(2)(a)

Silverstream Landfill and Transfer Station Supervisor, Silverstream

s7(2)(a) is the current Landfill and RTS Site Manager and will be responsible for the daily operations and management of the transfer station and landfill operations. s7(2)(a) objectives will be based around achieving increased resource recovery from the refuse stream. s7(2)(a) is committed to ensuring WMNZ provides a safe and enjoyable workplace for all staff and visitors, will ensure a highly efficient site is maintained, and that all customers receive exceptional customer service.

s7(2)(a) will also ensure that vehicles utilising the landfill can tip off their load quickly, without any delays. s7(2)(a) has proved to be an exceptional team leader, with an ability to motivate staff to carry out tasks safely and efficiently. He has an excellent ability to manage people and ensure that health and safety on and around the landfill is maintained by his team.

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Health, Safety, Environmental and Quality Lead | s7(2)(a)

Head of Safety and Risk, Auckland

As the WMNZ Head of Safety and Risk, s7(2)(a) will be involved in giving technical advice and support to our Landfill Operations team in the maintenance of HSE objectives, targets, and strategies; provide technical advice and support to managers, supervisors and workers in the identification, assessment and control of workplace risks, including purchasing decisions and plant modifications. s7(2)(a) will coordinate all aspects of WMNZ Health, Safety and Environment (HSE) functions for the contract, ensuring our safety-first culture is then directly reflected in our Council contract. s7(2)(a) will provide a central point of contact for HSE legislation, standards, and statutory requirements applicable to Wellington, and will provide updated plans and procedures for the new development phases of the landfill.

Sustainability and Innovation Manager | s7(2)(a)

Sustainability Manager, Auckland

s7(2)(a) in-depth knowledge and practical experience of sustainability and environmental issues extend to strategy, monitoring and achievement of KPIs within large complex organisations. He is familiar with stakeholder engagement with external organisations such as Toitū, Iwi, and local and central Government. He also has strong negotiation skills, managing relationships and active participation to create sustainable business practices at all levels of an organisation. He has a Bachelor of Business, a Postgraduate Diploma of Business – Administration, and a Master of Science in Environmental Management.

With over 13-years' experience in the sustainability and environmental space, s7(2)(a) will be available to support our landfill team with decarbonisation initiatives at the landfill, and assist our Lower North Island divisional sustainability champions and our specialist landfill engineers with carbon emission reporting requirements for HCC.

Landfill Project Engineer and Decarbonisation Input | s7(2)(a)

Technical Manager, Operational and Technical Services (OATS), Auckland

s7(2)(a) is a Senior Landfill Project Engineer and will provide support to the Silverstream landfill operations team for the transition to the Phase 2 and Phase 3 development, including being the key contact for decarbonisation initiatives and development of operational methodology. s7(2)(a) will provide sound engineering leadership and input into operating methodologies, plant and equipment, and input into site development.

A highly experienced and qualified civil engineer, s7(2)(a) has over 30 years' experience (with at least half of that in landfill construction) working across a broad range of international civil construction projects including bulk earthworks, water/wastewater treatment plants, reinforced concrete structures, piping excavations, bridges and roading, as well as minor construction works. s7(2)(a) administrative skills are of a high level incorporating strong financial and resource management experience.

Specialist Landfill Optioneering Input | s7(2)(a)

General Manager, Operational and Technical Services (OATS), Auckland

s7(2)(a) will lead and oversee specialist input provided by our Operations and Technical Services team for best practice advice into the Phase 2 and 3 operating methodologies.

In his current role as General Manager – Operations and Technical Services (OATS), s7(2)(a) is responsible for the provision of technical, operational, project and routine development support services to the WMNZ business in the areas of Alternative Waste Treatment, Landfill and Transfer Stations, Fleet, Plant and Equipment, Materials Recovery Facilities, Joint Venture Management and Major Stakeholder management. s7(2)(a) adds considerable value to Councils in helping assess the viability of options and assisting with the design and development of implementation strategies and plans.

s7(2)(a) joined the company as Project Development Manager in 1996. In 2002, s7(2)(a) became Divisional Manager – Landfills and Project Development, responsible for two regional landfills in Auckland, and WMNZ interests in landfills in New Zealand and Australia. s7(2)(a) is recognised as an industry leader in the development and operation of landfills in Australasia. He managed the successful Waste Disposal Services joint venture between Auckland Council and WMNZ in 1999 and led the consenting and development processes for extensions to the Redvale and Whitford Landfills in Auckland.

s7(2)(a) is a Director of Transwaste Canterbury Limited, a JV with Canterbury Councils. He is also a Director of Pikes Point Transfer Station Limited. Particular areas of focus for s7(2)(a) are project management, design, consenting, development and the operation of resource recovery facilities and modern landfills, emissions reductions and business efficiency improvements. s7(2)(a) also brings ten years' experience in local government engineering, 15 years as CEO of Waste Disposal Services, and 19 years as a senior manager at WMNZ.

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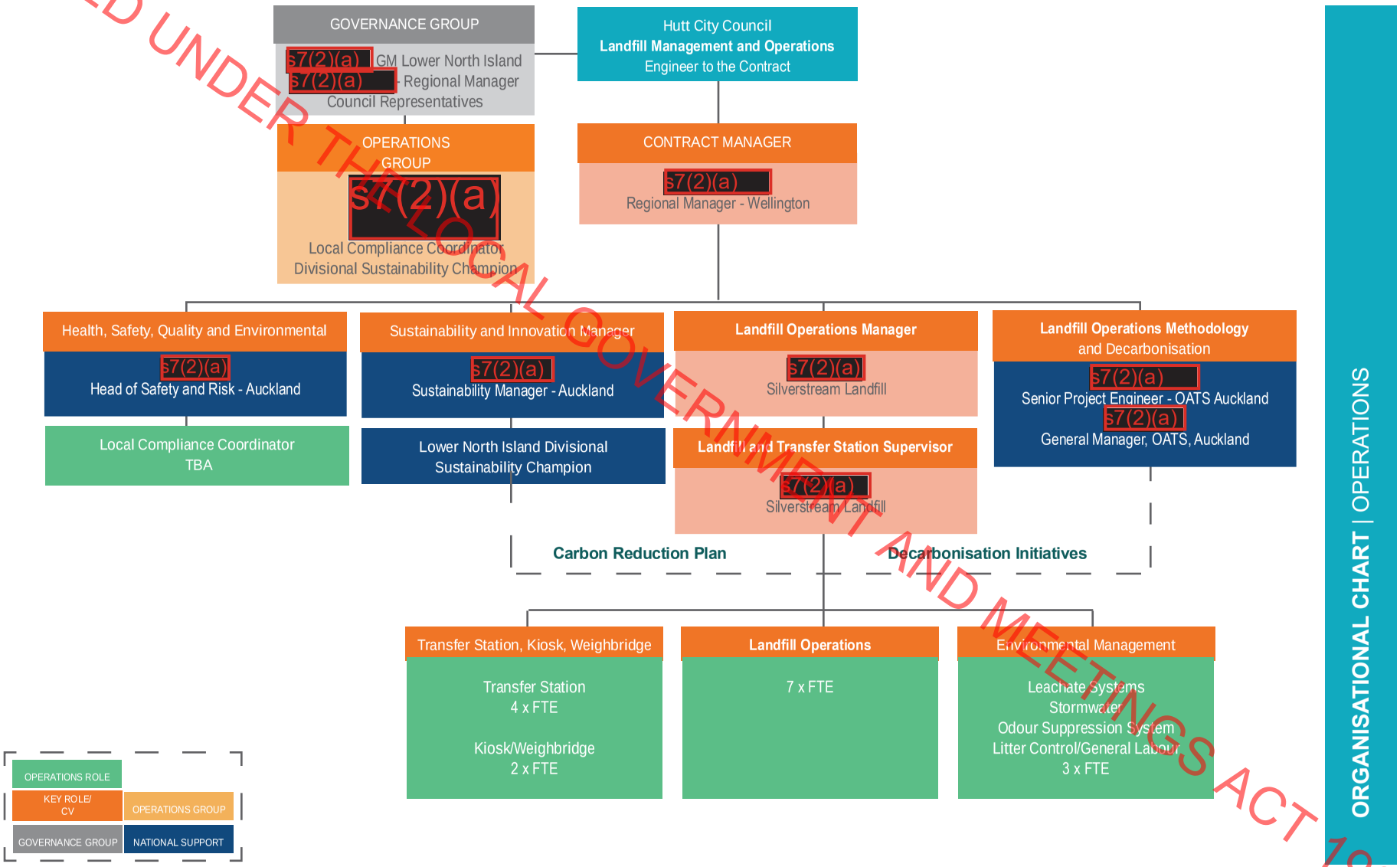
Contract Organisation Chart



ORGANISATIONAL CHART | OPERATIONS

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Management Systems

WMNZ's Wellington operations currently hold and will maintain ISO Quality Certification in the areas listed below. Copies of these certificates are included in Appendix A. This contract would operate under these ISO management systems:

- **Telarc Certificate of Registration - Quality Management System - ISO 9001:2015**
- **Telarc Certificate of Registration - Environmental Management System - ISO 14001:2015**
- **Telarc Certificate of Registration - Safety Management System - ISO 4801:2018**

A key aspect and focus of WMNZ'S Quality Plan will be to demonstrate how we will measure that all contract requirements are delivered in full, on time and to specification.

WMNZ's management systems and procedures play a vital part in ensuring the quality of our Contract works at a local level, these aspects include:

- Determining and understanding the requirements and needs of our customers and stakeholders.
- Focusing on customer expectations by providing quality products, responsive service, timely supply, and establishing positive supplier relationships.
- Complying with all applicable laws, standards and customer requirements and where requirements differ ensuring the highest standard is implemented.
- Providing and managing adequate resources, information, responsibilities and training programs necessary to enhance our skills in the selection of equipment, materials and methods to satisfy customer requirements and to deliver on quality objectives.
- Identifying and implementing corrective and preventative control measures to eliminate the cause of actual or potential non-conforming activities, products or services.
- Continuously improving quality management processes through monitoring, auditing, and review.
- Communicating this policy to all our workers and interested stakeholders and reporting on our quality performance openly and transparently.

The contract will be monitored closely through the following processes:

- Routine communication between Council and WMNZ at operational level.
- Monthly Contract Report and Contract Meetings between Council and WMNZ.
- Monthly Activity Report to WMNZ Executive Team and Board.
- Monthly WMNZ Business Operating Report and Reviews.

In addition to the above processes, we propose that a Governance Board be established for this contract. This Board will include senior representation from Council with WMNZ represented by s7(2)(a) General Manager Lower North Island and s7(2)(a) Contract Manager. The purpose of this Board will be to ensure timely strategic decision making aligned to Council's needs and will reflect on overall contract performance.

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Relevant Experience (15%)

Relevant Experience
Generally & Reference Projects

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Relevant Experience Generally

WMNZ's experience in the management and operation of world class landfills is unparalleled in New Zealand with management and operational interests in six landfills in New Zealand (Redvale, Whitford, Tirohia, Bonny Glen, Silverstream and Kate Valley). WMNZ provides the following information as relevant experience generally as a company:

B) Experience With Contracts for Works Similar in Nature and Similar Size to the Contract Works Under this RFT

WMNZ's experience in the management and operation of world class landfills is unparalleled in New Zealand, with management and operational interests in seven landfills in New Zealand (Redvale, Whitford, Bonny Glen, Tirohia, Silverstream, Green Island and Kate Valley).

WMNZ's Upper North Island division is responsible for landfill management and daily operation at the wholly owned landfills at Redvale and the Joint Venture landfill at Whitford. WMNZ's South Island division (which includes CWS) is responsible for landfill management and daily operation at the JV Kate Valley landfill (on behalf of Transwaste Canterbury) and at Green Island Landfill in Dunedin for Dunedin City Council.

WMNZ's Lower North Island division manages wholly owned Tirohia Landfill in the Waikato, and is under contract to Upper HCC for the daily management and operation of Silverstream landfill in Wellington. Additionally, we are involved in the financial management of the Joint Venture Bonny Glen Landfill near Marton.

WMNZ's OATS team offers a landfill technical and operational advisory service to the above operating divisions.

C) Experience with Work in the Wellington Region and in Particular to Working in Landfills in Steep Incised Valleys

WMNZ is the incumbent contractor for Silverstream Landfill and has been for the past 20-years. The geographic terrain is challenging in that it comprises of a steep bush clad valley screened on all sides from public roads and developed areas. Throughout the years of operating on the landfill, WMNZ has adapted various components of our operational methodology to suit the challenges of the site including reviewing methods for vehicles transporting and placing waste from the transfer station to the tip face, for example most landfills use a bulldozer to push waste from the truck tipping pad. In 2011, the landfill team moved away from using a bulldozer and used front-end loaders to provide versatility for loading aggregates as well as the normal practice for pushing refuse. It has been found that the loader tyres seals the earth surface of the truck turning area reducing the risk of trucks getting stuck in muddy terrain.

Throughout the years of operating on the landfill, WMNZ has adapted various components of our operational methodology to suit the challenges of the site.

The Tirohia Landfill site is similar to Silverstream Landfill and is located in a small narrow valley with limited space. Whilst Tirohia is not located in the Wellington region, we have proposed the same specialist landfill engineers to work on developing the operational methodology for the new phases of development at Silverstream.

D) Health and Safety Experience

WMNZ is committed to maintaining a safe and healthy working environment for its workers and others, while also minimising both potential and actual environmental harm and events that could affect business continuity. All WMNZ sites have bespoke health, safety, quality and environmental management plans built to ISO standards. Every site is required to provide monthly health and safety compliance reporting and we have a dedicated health and safety team (with over 25 local compliance coordinators) who manage health and safety for the business.

E) The Relevant Experience and Expertise of your Key Subcontractors in Areas Comparable with this Project

Most of our landfill operations utilise national suppliers for servicing plant and equipment for example Bridgestone Tyres, Terracat and other local maintenance providers. WMNZ will not be subcontracting out any services under this RFT.

F) Traffic Control Experience

All WMNZ large sites including landfills, transfer stations and resource recovery parks require Traffic Control. As part of our HSEQ Risk Assessment Process, Traffic Management Plans are prepared as part of contract requirements. The Traffic Management plan outlines the designated traffic rules on site and to provide a safe system for employees, visitors, and contractors. The Branch Manager, Supervisor, and employees review Traffic Management Plans on a regular basis as the needs and issues of the site change and develop. Any changes are subjected to further risk assessments. The Traffic Management Plan is reviewed as a minimum on an annual basis.

Silverstream Landfill has an existing Traffic Management Plan in place for controlling traffic around the site.

G) Public Contact Experience

WMNZ owns and operates many public facing facilities whether this be through landfills to transfer stations or resource recovery parks. WMNZ is committed to contributing to and enhancing the wellbeing of its neighbouring communities. We remain acutely aware of how important it is to play an active role in our communities by creating opportunities to communicate and engage to create shared understanding over time. This has become more important over the decades, and at our landfills, where health and safety requirements mean our neighbours and the general public are unlikely to come inside our operations on a

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day-to-day basis.

H) Experience in Dealing with Difficulties, Emergency and Contingency Planning

Every WMNZ site has a bespoke Site Emergency Management Plan (SEMP) and is the principal function to ensure the safety of employees, contractors, visitors and the surrounding natural environment in the event of an unplanned incident or emergency, and prevent further harm or disruption to business operations.

WMNZ has robust risk management and business continuing procedures in place for the handling of emergencies. An example of this is our COVID-19 pandemic response as an essential services provider under the Health Act 1956. WMNZ continued to safely collect, process and dispose of waste across New Zealand throughout the entirety of the lockdown periods. This was only achievable by our emergency and contingency planning procedures WMNZ had in place.

I) Systems for Innovation and Continuous Improvement Including Evidence of How These Have Been Applied on Other Contracts

WMNZ as a company is strongly committed to environmental sustainability. This is clearly articulated in our "For Future Generations" sustainability strategy, launched in 2018. WMNZ was the first waste services company in New Zealand to develop and publish a detailed sustainability strategy of this type.

One of the key projects we are undertaking to reduce our carbon emissions is the creation of our Divisional Sustainability Champions and providing each WMNZ business unit with a carbon budget. This has allowed each business unit with the ability to calculate monthly carbon emissions and implement carbon reduction targets. The Lower North Island Divisional Sustainability Champion will be applied to the Silverstream Landfill project for providing actual visibility with carbon emissions.

One of the key projects we are undertaking to reduce our carbon emissions is the creation of our Divisional Sustainability Champions and providing each WMNZ business unit with a carbon budget.

J) Consistently Maintaining Specified Performance Standards and The Quality of Data Supplied in Reporting (Quality Management Systems)

Our success depends entirely upon ensuring our customers are satisfied, whether they are individuals, other businesses, or Council customers. Our track record of achieving very high customer satisfaction scores in regular Council resident surveys is testament to this.

All our contracts require meeting performance targets (KPIs) this includes data and quality management. WMNZ has robust systems in place for managing Quality including meeting ISO standards. WMNZ regularly provides all our major customers with monthly reports utilising data that is extracted from weighbridge systems, JDE our invoicing platform and ELEMOS our operating platform.

K) Experience with Providing Services to Other Businesses (Including Interfacing with Other Businesses, Financial Management (Invoicing Etc) and Health And Safety Interaction)

WMNZ provides services to multiple businesses including councils and third-party users at all the landfills we own, operate and manage. We use JDE Enterprise and Weighbridge software for accurate invoicing. Each WMNZ landfill site has strict protocols regarding health and safety inductions for any subcontractors or visitors to landfill operations. WMNZ also sees itself as part of the communities within which we operate.

Image: WMNZ as a company is strongly committed to environmental sustainability. This is clearly articulated in our "For Future Generations" sustainability strategy.

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Relevant Experience and Reference Projects

WMNZ provides below three reference projects that are directly relevant to the works under this RFT:

Tirohia Landfill and Energy Park

Tirohia, Waikato

B) Experience With Contracts for Works Similar in Nature and Similar Size to the Contract Works Under this RFT

The Tirohia Landfill is a long-established feature in the Tirohia community. WMNZ purchased the site from HG Leach in 2016 and has been continuing to operate the existing landfill cell since that time.

WMNZ has invested in significant improvements to the existing landfill operations, to the benefit of the environment and local community. These significant improvements made to the operation of Tirohia Landfill are good examples of our experience with operational methodologies on a landfill similar to Silverstream and demonstrates our approach to ensuring operational excellence in practice

Tirohia continues to receive disposal from Thames Coromandel District Council, Matamata Piako District Council, and Hauraki District Council despite not having an existing contract in place with any of them.

C) Experience with Work in the Wellington Region and in Particular to Working in Landfills in Steep Incised Valleys

The topography, terrain and size of Tirohia is quite similar to Silverstream's. We have sufficient experience in operating a landfill under these conditions. Tirohia is located in a small, narrow valley with limited space. We work within these constraints by working from the bottom up, filling the bottom first and completely using gravity as an advantage rather than a limitation.

Spreading waste over a steep face often produces build up on the edges. We follow a proven method for ensuring this waste gets adequate cover and spread.

D) Health and Safety Experience

Tirohia has its own Health and Safety Management Plan and strives for Zero Harm. There have been no fatalities, and we record Loss Time Injuries (LTI)s as part of our process towards continuous improvement. We comply with all WorkSafe and WMNZ standards, which includes monthly meetings, regular internal and external audits, and reviewing events and policies. There are systems and procedures in place that are well observed.

E) The Relevant Experience and Expertise of your Key Subcontractors in Areas Comparable with this Project

Tirohia has well established relationships with contractors, some of whom have been used for almost a decade and are also used on other WMNZ landfills including Silverstream. These include:

- NZAS-Spray on Lining work and NZAS-cell development.
- Terracat-mechanical equipment service.
- HG Leach- mechanical work.
- TransDiesel for machine maintenance.
- BR and SL Porters for leachate removal.
- AllTerrain Chipping for compost chipping.

F) Traffic Control Experience

Tirohia is a closed site not open to the public. We maintain a Traffic Management Plan (TMP) and an induction process. We subcontract to a private company when specific management is required, such as picking up wind-blown litter on the NZTA highway as part of our consent condition.

G) Public Contact Experience

The Tirohia Landfill Operations Team has developed and maintained a strong relationship with Tirohia School, occupying the land adjoining the site to the northeast and whilst the site is not open for public access the team regularly hosts school group visits as well as other community groups interested in the landfill operation. Tirohia is currently in the process of working towards receiving consent to build a second cell and relies on public consultations, open days and working groups to work towards that goal.

H) Experience in Dealing with Difficulties, Emergency and Contingency Planning

In line with standard WMNZ practice, we have a site-specific Emergency Response Plan (ERP) and a Site Business Continuity Plan (SBCP). We also have back up diesel generators in case of power outages. Tirohia works closely with the local fire brigade. Whilst we have had small fires that are common occurrences in landfills, we have had no significant events.

I) Systems for Innovation and Continuous Improvement Including Evidence of How These Have Been Applied on Other Contracts

The Tirohia site benefits from WMNZ tested procedures from operating four energy parks and implementing improvements wherever we see opportunity. We've installed additional generators to produce more power from the gas captured. We have converted our yellow gear to newer, more efficient equipment. We have installed odour-canons to control odour.

The Tirohia Landfill includes involvement from WMNZ's specialist landfill engineers who are also nominated in the Silverstream Tender. This knowledge sharing from development of other landfills will be of real benefit for the Silverstream project with a particular focus on operational methodology and plant and equipment efficiencies that have been applied to Tirohia.

J) Consistently Maintaining Specified Performance Standards and The Quality of Data Supplied in Reporting (Quality Management Systems)

WMNZ complete monthly environmental reports, an annual report on the Waste Levy for the Ministry for the Environment (MfE), and reporting on gas-capture.

K) Experience with Providing Services to Other Businesses (Including Interfacing with Other Businesses, Financial Management (Invoicing Etc) and Health And Safety Interaction)

The Tirohia Landfill provides a service to multiple councils and third-party users. We use JDE Enterprise and Weighbridge software for accurate invoicing. We follow strict protocols of SOPs regarding health and safety inductions for any subcontractors or visitors to the landfill.

Kate Valley Landfill and Energy Park
Teviotdale, Canterbury

B) Experience With Contracts for Works Similar in Nature and Similar Size to the Contract Works Under this RFT

Kate Valley Landfill is the most comprehensively engineered waste management facility in the South Island of New Zealand. The 37-hectare site was designed and operates to the highest international standards, fully compliant with New Zealand landfill guidelines and the US Environmental Protection Agency and European Union standards for municipal waste landfills.

The design and operation of the Kate Valley Landfill addresses all the known environmental risks and concerns. In addition to being built on impermeable siltstone, the Landfill has a multi-layered liner that completely seals the base and sides of the Landfill.

The use of containerised waste transport has made waste handling safer and cleaner, and enabled more efficient unloading and disposing of waste within the Landfill. The choice of site even inspired an ambitious project to regenerate a coastal native forest at the adjacent Tiromoana Bush.

C) Experience with Work in the Wellington Region and in Particular to Working in Landfills in Steep Incised Valleys

This contract demonstrates WMNZ's relevant experience with all landfill operating activity, including daily cover, gas collection, flaring and disposal, power generation from landfill

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gas, leachate collection, treatment and disposal, waste placement, all vector control, surveying, special waste checking, placement and burial, weighbridge operation, data management, container maintenance, plant and vehicle maintenance, chemical sampling, density measurements, resource consent compliance, and management of waste transport from transfer stations to landfill. This experience can be applied by the same WMNZ in-house Operations and Technical Services (OATS) team to the new development of the Silverstream Landfill operations.

D) Health and Safety Experience

Since the Kate Valley Landfill opened there have been no serious injuries to staff or visitors. That's because both the Board, and WMNZ who has the contract to operate the Landfill, place great importance on the day-to-day implementation of health and safety policies and practices. The Board receives a detailed Health and Safety report from WMNZ each month.

E) The Relevant Experience and Expertise of your Key Subcontractors in Areas Comparable with this Project

Most of the initial capital works, from 2004 to 2008, were carried out by external contractors under a range of contract types, from an alliance through to publicly tendered full delivery NZS3910 type contracts. From 2008 approximately 35% of the annual capital works have been carried out by directly employed labour and resources, and the balance completed by a wide range of experienced contractors. The design and contract management of most of the works is undertaken by the WMNZ in-house Operations And Technical Services (OATS) team, with external advice from specialist consultants. A number of maintenance and service contractors are extensively used for plant and machinery.

F) Traffic Control Experience

We have approved TMPs in place, which are reviewed annually. New, temporary TMPs are written as required. The site has demarcation zones for vehicles entering the site and the landfill is strictly managed by spotters and other landfill operations staff.

G) Public Contact Experience

The strategic partnership includes a focus on community engagement, and we dedicate one week annually to running a formal education program. We engage with school groups nationally through live streaming, reaching up to 3,000 senior primary students.

We also host pre-booked visitors of various interest groups, averaging six to seven a month during the summer. We follow up the presentation in the office with a guided visit on the bus to vantage points from which operations can be viewed. Kate Valley is not open to the general public for use.

H) Experience in Dealing with Difficulties, Emergency and Contingency Planning

This facility operates with a Site Emergency Management Plan (SEMP), Transport Contingency Plan (TCP) and a Site Business Continuity Plan (SBCP). As per WMNZ's Systems policies, these plans provide direction in emergency preparedness, immediate response and business continuity planning in preparation and planning for emergencies, including natural disasters, fire and severe weather events.

I) Systems for Innovation and Continuous Improvement Including Evidence of How These Have Been Applied on Other Contracts

This operation is widely regarded as one of the best in Australasia, due to the successful long-term collaborative approach between all of the JV partners.

The success of the Kate Valley Landfill JV has been recognised in its winning the IPENZ Engineering Excellence Award in 2006 and the ACENZ Gold Award for Engineering Excellence in 2007. CWS has also won two Champion Canterbury Awards, in 2007 and 2010.

The Kate Valley Landfill includes involvement from WMNZ's specialist landfill engineers who are also nominated in the Silverstream Tender. This knowledge sharing from development of other landfills will be of real benefit for the Silverstream project with a particular focus on operational methodology and plant and equipment efficiencies that have been applied to Kate Valley.

This operation is widely regarded as one of the best in Australasia, due to the successful long-term collaborative approach between all of the JV partners.

J) Consistently Maintaining Specified Performance Standards and The Quality of Data Supplied in Reporting (Quality Management Systems)

We complete monthly and annual reporting, using KPI and SOIs as milestones as part of our standard business procedures. Specific annual reports get presented to the consenting authorities.

K) Experience with Providing Services to Other Businesses (Including Interfacing with Other Businesses, Financial Management (Invoicing Etc) and Health And Safety Interaction)

Whilst the landfill is owned and operated by Transwaste Canterbury Ltd to provide services to its shareholders, the landfill equally provides service to many private companies and waste-generators in the region.

Kate Valley Landfill being a joint venture provides a monthly report to the JV board as well as internal WMNZ reports related to health, safety, environment and finances. Access to the landfill is controlled and limited to pre-approved account holders only. No 3rd party cash sales occur on site.

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Silverstream Landfill
Stokes Valley, Lower Hutt

B) Experience With Contracts for Works Similar in Nature and Similar Size to the Contract Works Under this RFT

WMNZ has been operating Silverstream Landfill since 1998. WMNZ has considerable knowledge and experience with Silverstream and has seen it evolve over the years. When WMNZ first took over the operations contract it was a standard lined landfill.

WMNZ has worked collaboratively with HCC and T&T over the contract duration. The landfill was opened for operation in 1972 and has gone through several significant design changes from the initial landfill which was unlined although leachate drainage was installed to the current Stage 2 which is designed to meet Class A landfill requirements.

WMNZ has considerable knowledge and experience with Silverstream and has seen it evolve over the years.

C) Experience with Work in the Wellington Region and in Particular to Working in Landfills in Steep Incised Valleys

Silverstream Landfill is in the Wellington region. The landfill receives both municipal and commercial waste. The landfill is in a very challenging geographical environment with steep incised valleys. The WMNZ team operating the landfill have a long length of knowledge and history of working in the unique Silverstream environment.

D) Health and Safety Experience

Silverstream Landfill has a bespoke Health and Safety Management plan in place which includes a site risk register that is communicated to staff operating and managing the landfill. WMNZ has a TRIFR rate of 3.0.

We comply with all WorkSafe and WMNZ standards, which includes monthly meetings, regular internal and external audits, and reviewing events and policies. There are systems and procedures in place that are well observed.

E) The Relevant Experience and Expertise of your Key Subcontractors in Areas Comparable with this Project

Key subcontractors/suppliers involved in Silverstream Landfill include

- Terracat and Cable Prices- mechanical equipment service providers.
- Bridgestone Tyres – tyres for fleet and yellow gear.
- Composting NZ Limited - Greenwaste mulchers.
- Technical Services for hazardous waste collection and removal.
- Reputable contracts for special project subcontractors for silt pond cleaning and cleaning out leachate grit traps.

All WMNZ subcontractors are required to go through a comprehensive subcontractor prequalification process that assesses their experience and internal compliance procedures.

F) Traffic Control Experience

For minor traffic control management WMNZ has trained staff for managing traffic flow at the landfill. For major traffic control requirements (i.e. when the main access road to the landfill was closed due to storm) WMNZ engaged a traffic management company for four days to control movement around the sites.

At the transfer station over the Covid-19 period, WMNZ engaged a traffic management company to ensure the public were unloading loads at an appropriate distance to each other.

G) Public Contact Experience

Silverstream Landfill is a putrescible refuse disposal site for the Hutt Valley and Upper Hutt region; it is available to domestic type customers, visiting with cars, utility vehicles, trailers and vans plus commercial type customer(s) larger trucks etc. Public contact for the site is at the kiosk and at the on-site transfer station. The Landfill Operations team also hosts visits to the landfill including schools and other community groups interested in the operation.

H) Experience in Dealing with Difficulties, Emergency and Contingency Planning

In line with standard WMNZ practice, Silverstream Landfill has a Site-Specific Emergency

Response Plan that provides direction in emergency preparedness. Examples at Silverstream include:

- Closing of main access road - the main access road to the landfill had to be closed due to storm and large pine trees had fallen across the road. On investigation a further 100 pine trees needed to be felled off the steep banks adjacent to the road. WMNZ engaged an arborist to fell the trees and a traffic management company engaged for to control movement around the sites.
- A Landfill fire occurred in 2015 on the commercial refuse. Emergency services were required to extinguish the fire, waste diversion had to be implemented to continue the acceptance of waste.

I) Systems for Innovation and Continuous Improvement Including Evidence of How These Have Been Applied on Other Contracts

HCC requested WMNZ investigate and advise what would be the best kiosk weighbridge system to install. WMNZ researched this and provided advice to HCC on the implementation of a Weightrax system. WMNZ has experience with this system and it is currently being used at other landfill and Resource Recovery sites around NZ.

HCC instructed the shredding of greenwaste and removal off site to reduce landfill gas emissions. WMNZ arranged for the greenwaste to be stockpiled and shredded for on-hauling to a compost facility.

J) Consistently Maintaining Specified Performance Standards and The Quality of Data Supplied in Reporting (Quality Management Systems)

The Landfill Manager completes a monthly compliance report to HCC and T&T that includes specific requirements relating to KPIs and consents. Since operating the Landfill, WMNZ has consistently achieved very high standards and supplies a range of data in our reports including transactions from the weighbridge.

K) Experience with Providing Services to Other Businesses (Including Interfacing with Other Businesses, Financial Management (Invoicing Etc) and Health And Safety Interaction)

The Silverstream Landfill team regularly interfaces with other businesses who are involved in the landfill including HCC, LMS Generation, Tonkin & Taylor, Geotechnics, Leach & Co and Earthlink.

There is 'Sign-in/Sign-out' procedure at the kiosk which is mandatory to ALL contractors and visitors (other than members of the public travelling to and from the Transfer Station) accessing the site beyond the kiosk. There is a team involved in operating the kiosk process and customer service that includes financial management (cash handling and invoicing) and health and safety interaction.

Strategic Partnerships Experience

s7(2)(a)

L) Examples of Strategic Partnerships (public or private sector) the involvement of key staff nominated in this project

WMNZ provides examples of strategic partnerships for our two contract management roles: Contractors Representative (s7(2)(a)) and Contract Manager (s7(2)(a)).

s7(2)(a) | General Manager, Lower North Island

Government Waste Advisory Board

WMNZ's Lower North Island General Manager s7(2)(a) has been appointed to the Government's Waste Advisory Board. He is one of eight people chosen to advise Minister for the Environment David Parker on everything related to waste management and resource recovery.

s7(2)(a) selection for the position is a real acknowledgment of his knowledge and standing within the waste industry. He is the only commercial waste industry representative and serves alongside representatives from a broad cross-section of stakeholders in the sector.

The Waste Advisory Board has been around since the introduction of the Waste Minimisation Act in 2008 and is a requirement under that legislation. s7(2)(a) will serve an initial three-year term, which can then be renewed.

WasteMINZ Board

Finding solutions to the challenges facing the waste industry, and New Zealand as a whole, is a driver for s7(2)(a), and has a position on the WasteMINZ board.

With over 1,400 members, WasteMINZ represents the waste, resource recovery and contaminated land sectors in New Zealand. As WMNZ's General Manager for the Lower North Island, s7(2)(a) is also the company's expert on recycling and resource recovery. Prior to this he had a 25-year career in construction materials supply.

s7(2)(a) also brings his strong experience liaising with local and central government to his role. Most recently, he was part of the waste industry advisory group that regularly met with government officials during the COVID-19 lockdowns to advise on best practice for continuing with the essential service of waste collection during Levels 3 & 4.

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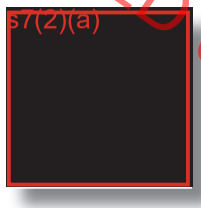

s7(2)(a) | Regional Manager, Wellington

s7(2)(a) brings with her 16 years of waste and material recovery management and strategic customer contract management experience.

In 2016 s7(2)(a) transitioned from Wellington Sales Manager to the Wellington Regional Manager. In this role she is responsible for the safe and efficient performance of all operations including Silverstream Landfill, with a fleet of 70 trucks and a team of 112 employees and contractors. s7(2)(a) has an outstanding track record for delivering a high-quality service to all WMNZ customers and is regularly called on for providing expert advice on waste minimisation and resource recovery initiatives.

s7(2)(a) has fostered excellent partnerships with the public and private sector in the Wellington region. For example, in 2020 s7(2)(a) was instrumental in forming WMNZ's approach to HCC Kerbside Collections Contract. This contract involved several innovations including an electric vehicle implementation programme to assist with reducing carbon emissions and was rolled-out successfully under difficult COVID-19 challenges all down to s7(2)(a) strong leadership and stakeholder engagement skills.

s7(2)(a) has also been involved in leading strategic engagements with several key commercial partnerships in the Wellington region. This has included driving sustainability targets for waste minimisation and material flow for resource recovery initiatives for the following commercial partnerships:

- AIR New Zealand
- OCS
- The Government Syndicate
- Wellington Stadium
- Wellington Zoo

WasteMINZ

s7(2)(a) recently represented WMNZ as a panelist for the 2022 WasteMINZ summit where she spoke on how WMNZ has adapted to a changing environment in response to COVID-19 challenges.

M) The Tenderers Approach to Providing Employment and Training Opportunities for Youth and Underemployed Members of the Hutt Valley Community in Delivering the Services

Pathways to Employment

WMNZ is currently in the process of arranging a stand at the upcoming Pathways to Employment event that is being organised by the Hutt Valley Chamber of Commerce on the 28th June 2022 which will see students from across the Hutt Valley attend. The purpose of this event is to broaden young students' knowledge and understanding about jobs in the Hutt Valley. This is an opportunity for us to change the perceptions of and combat stereotypes around the waste industry. WMNZ will also be engaging with the Hutt Valley Chamber of Commerce to engage with local schools to offer work experience on a regular basis.

Hiring Local

On the current HCC Kerbside Collections contract WMNZ has 19 staff in total who have all been employed locally. All staff operating the Silverstream Landfill are locals. Should we be successful, WMNZ will continue to hire local people and we have a number of pathways available to youth looking for a career in the waste industry and will utilise these methods to attract new staff. WMNZ also partners with local schools (Hutt High and Taita College) and are able to offer young people the chance to be upskilled by WMNZ.

Opportunities to Upskill

WMNZ work hard to support our employees to develop as much as they can during their employment at WMNZ. We have a tailored made course on offer called Skills First run by our partner Upskills. The programme consists of 25-hours of workshops over three full days spread over a duration of about 8 weeks. The Customer service course helps our teams build communication and problem-solving skills as well as building their confidence with language. In 2018, we won a Skills Highway award for Champion Employer, and in 2017 we won a Skills Highway award for our Skills First Literacy and Numeracy Programme.

As well as Skills First, we also provide an internal driver activation programme to upskill existing drivers and operators as well as developing new drivers and operators, encouraging our staff to upskill and learn new roles within the business. We also offer a Leadership programme in partnership with Upskills and Competenz, giving staff the skills required in managerial positions or looking into developing some of our growing staff members. Upon completion they will receive a NZ certificate in Business (Team Leadership) which is a Level 3 NZ recognised qualification.

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HUTT CITY TE AWA KAIRANGI

Tō tātou tāone
Our city

Decarbonisation (10%)

Attachment C | Non-Price Attribute Evaluation Criteria

(B) COMPARATIVE CRITERIA

Image: Redvale Landfill and Energy Park, Auckland

Decarbonisation (10%)

A) Evidence of Experience and a Track Record for Decarbonising Services

As the first waste company in New Zealand to have our carbon footprint independently audited, and to set aggressive annual reduction targets for carbon emissions, we understand just how much these outcomes need uncompromising focus to deliver the required results. WMNZ has considerable experience with decarbonising services as outlined below.

Electrification or Decarbonisation of Fleet

We are committed to reducing our greenhouse gas emissions. For the most effective gains in the near future, we are specifically focusing on reducing our diesel emissions which are currently 71% of our carbon footprint. WMNZ was the first to introduce 100% plug-in electric trucks into a waste collection fleet in New Zealand back in 2016, and we opened a purpose-built facility to assemble more Electric Vehicle (EV) trucks. At the end of 2021 we had 26 electric trucks, as well as 92 electric cars and light vehicles in our fleet. We will keep increasing this number and, with a total fleet of over 800, expect to make a significant emissions reduction impact.

Our EV conversion programme is well advanced with EVs working across a range of commercial and municipal collection profiles. Assessment of a route profile is made and compared to the current performance parameters of our EV truck of that service type to ensure an EV can complete the route on a single battery charge. The tables below summarise our EV trucks in service.

In Service EV Trucks			
Truck Type	No. in Fleet	Range (km)	Bin Lifts
Box Body	5	200-250	
Side Loaders	2	125	1200
Rear Loaders	11	100 - 180	300 - 600
LEV - Glass/ Food	5	180	
Multi-purpose	1	180	300 - 600
Skip Truck	3	200-250	11
Total	27		

§7(2)(a)

Electric vehicle implementation example

Hutt City Council – Kerbside Electric Vehicles

A recent example of the decarbonisation of the fleet was for the Hutt City Council Kerbside Collections Contract.

WMNZ provided HCC with an EV implementation strategy for collection vehicles. With 11 new electric rubbish and recycling trucks on the road now and a fully electric fleet planned by 2024, this will help reduce carbon emissions and be the largest EV fleet both commercially and municipally in New Zealand.

Bin Diesel, Truck Norris, Trucky McTruckface & Recyclosaurus Rex are now on the road making collections, along with with Bruce Springclean, Trash Gordon & Chitty Chitty Bin Bin.

The EV fleet is on this contract is WMNZ's largest EV fleet in the country – both commercially and municipally.

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Contact Persons Responsible for Decarbonisation for this Project

s7(2)(a) s7(2)(a), WMNZ Sustainability Manager will provide best practice advice to the Silverstream Landfill Operations team on developing and maintaining initiatives to decarbonise operations at the Silverstream Landfill.

s7(2)(a) in-depth knowledge and practical experience of sustainability vironmental issues extend to strategy, monitoring and achievement of KPIs within large complex organisations. He is familiar with stakeholder engagement with external sustainability organisations, including Toitū, Iwi, and local and central Government.

Recently s7(2)(a) was involved in providing operational and embodied carbon calculations to Dunedin City Council for the evaluation of WMNZ's tender for kerbside collections and resource recovery park procurement. This included providing carbon footprint calculations for kerbside collections and for the design and construction of the new facilities. Carbon was a key consideration for this tender where the service offering needed to demonstrate the ability to show carbon emissions directly relating to our service deliverables. s7(2)(a) was a key contributor to this process.

s7(2)(a) s7(2)(a), Senior Landfill Project Engineer will be providing advice around solutions for further decarbonising the Silverstream Landfill project. s7(2)(a) will be able to provide input and advice for efficiencies in plant and equipment and assistance with developing the Carbon Reduction Plan.

s7(2)(a) is based at Redvale Landfill in Auckland, and he has considerable experience with lead ologies and best practice with landfill plant and equipment. s7(2)(a) is at the forefront of emerging electric and hybrid technologies for plant and equipment. He will be involved in providing advice on decarbonisation initiatives relative to landfill operations and operational methodology. He will work with the Silverstream Landfill Operations Team, Lower North Island Divisional Sustainability Champion and the Sustainability and Innovation Manager on implementing emerging changes to technologies and assisting WMNZ and HCC with meeting decarbonisation requirements under this contract.

Ability to Calculate Carbon Footprint

Branch Level

Each of our five divisions have emission reduction budgets for 2022 along with monthly carbon footprint reporting, and our Carbon Footprint Reduction Committee meets every quarter to manage and work on reduction initiatives. Carbon Reporting forms part of divisional monthly business review meetings and ties into WMNZ's overall sustainability strategy which is publicly reported on annually.

Company Level

WMNZ is the first waste company/landfill operator in New Zealand to calculate an externally audited comprehensive carbon footprint through the Toitū CarbonReduce programme. WMNZ's largest emissions are Scope 1 which make up 89% of our carbon footprint. These predominantly come from our landfills and diesel use through our truck fleet. Direct emissions (Scope 1) occur from sources that are owned or controlled by the Company.

70% of WMNZ's total carbon footprint is from landfills, which reflects the amount of waste generated

70% of WMNZ's total carbon footprint is from landfills, which reflects the amount of waste generated by the communities we serve, and this waste is highly variable. As we do not directly control the amount of waste generated by communities, our carbon footprint reduction plan focuses on reducing our operational carbon footprint, which specifically excludes landfill emissions. We do not use carbon offsetting to meet our reduction targets.

Notwithstanding this, WMNZ remains focused on limiting the emissions from our landfills, ensuring we capture maximum landfill gas to generate renewable electricity. This can be seen through our three years of ownership at Tirohia Landfill and Energy Park, where we have successfully improved landfill gas capture from 30% to 90% resulting in the unique emission factor for the Ministry for the Environment dropping from 0.7248 tCO2e/t (tonnes of carbon dioxide equivalent) in 2018 to 0.119 tCO2e/t in 2020.

For transparency we will continue to report our total carbon footprint, which includes landfill emissions.

WMNZ completed its first carbon footprint back in 2017, and has a reduction target of 2.5% per year in operational GHG emissions by intensity against this 2017 baseline of 131.6 tCO2e/$m. Our 2021 carbon footprint result was 107.4 tCO2e/$m, a successful reduction of 18.4%. Regarding absolute operational GHG emissions, WMNZ has achieved a 9.1% reduction from 63,440 tCO2e in 2017 to 57,931tCO2e in 2021.

Our base year is 2017, and an equity share approach was used to calculate our carbon footprint. The table on the following page demonstrates WMNZ's latest carbon footprint calculation results:

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	2017	2018	2019	2020	2021
Waste Management's Carbon Footprint 2017 to 2021					
t CO2e, Waste management CEMARS, Scope 1	161,864	124,382	200,732	174,584	178,861
t CO2e, Waste management CEMARS, Scope 2	904	929	736	816	803
t CO2e, Waste management CEMARS, Scope 3	26,187	26,612	25,408	21,513	21,830
Total gross carbon footprint	188,956	151,923	226,875	196,913	201,495
Waste Management's Operational Carbon Footprint 2017 to 2021					
t CO2e, Waste management CEMARS, Scope 1	36348	36706	36889	36411	35298
t CO2e, Waste management CEMARS, Scope 2	904	929	736	816	803
t CO2e, Waste management CEMARS, Scope 3	26,187	26,612	25,408	21,513	21,830
Total gross operational carbon footprint	63,440	64,247	63,033	58,740	57,931
Waste Management's Intensity Carbon Footprint 2017 to 2021					
Revenue $millions	482	509	521	507	540
Total intensity operational carbon footprint	131.5	126.2	121.0	115.9	107.4

Experience Relating to the Development of Carbon Reduction Initiatives

Landfill Carbon Reduction Initiatives

WMNZ has a dedicated Sustainability Team who are responsible for company carbon reduction initiatives and managing deliverables set out in our Sustainability Strategy as well as guiding and directing our Divisional Sustainability Champions at branch level. Each of WMNZ's five divisions operate in this way and reflects the company wide commitment to achieving our carbon footprint budgets each year.

At Silverstream Landfill, the Operational Team monitors and tracks progress towards reducing operational carbon footprint targets by monitoring fuel usage of plant and equipment and encouraging staff to reduce usage of electricity. The below table highlights recent carbon reduction initiatives directly relating to our landfill operations to support our emission reduction plan to achieve the carbon footprint budgets.

Landfill Carbon Reduction Initiatives		
Site	Action	Type
Silverstream **Landfill**	Promote energy saving tips throughout the branch, encourage staff to reduce usage of electricity including turning off lights and appliances at the end of the day.	GHG Emission Reduction
Silverstream **Landfill**	Continue to encourage reducing all waste streams within the branch, promote reuse and recycling where possible.	Waste Minimisation

Landfill Carbon Reduction Initiatives		
Site	Action	Type
Silverstream **Landfill**	Monitor and track progress towards reducing operational carbon footprint target that includes reducing travel costs for plant operation across the landfill, monitoring fuel usage on landfill machines and carpooling for travelling around the site.	GHG Emission Reduction
Tirohia Landfill	Encourage staff to practice the right way of recycling and increase environmental awareness (via annual environmental awareness training).	Waste Minimisation
Tirohia Landfill	Site Management to ensure all building lights and appliances (where practical) are switched off at the end of each shift.	GHG Emission Reduction
Tirohia Landfill	Report reviews on idling to reduce fuel consumption and carbon footprint.	GHG Emission Reduction
Tirohia Landfill	Maintenance Crew to keep register of waste being generated by WMNZ staff on site.	Waste Minimisation
Redvale Landfill	Meet the Gas Destruction objectives for the site i.e. achieve/exceed the 90% destruction target.	GHG Emission Reduction
Redvale Landfill	Reduce site power consumption through efficient behaviours and equipment. Complete electrical audit, investigate solar options for site.	GHG Emission Reduction
Redvale Landfill	Monitor fuel usage on mobile plants and machines available on the site.	GHG Emission Reduction
Whitford Landfill	Fuel use analysis for operational plant.	GHG Emission Reduction
Whitford Landfill	Weigh site waste bins and record data in ELEMOS.	Waste Minimisation
Whitford Landfill	Turn off lights and aircon when not in office/lunch-room.	GHG Emission Reduction
Kate Valley **Landfill**	• Waste placement travel reduced by pushing waste downhill rather than uphill. • Workstation management - computers, lights, AC/heat pump and reducing vacuum use by promoting manual cleaning. • Benevap on site leachate treatment to cease haulage to Bromley.	Waste placement travel reduced by pushing waste downhill rather than uphill

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Company Carbon Reduction Initiatives

We view all major decisions through an environmental lens, specifically prioritising the impact of our activities on our carbon footprint, energy and water use, direct discharges, and biodiversity. Our latest Sustainability Report reflects the challenges experienced by our business, New Zealand and the globe as we faced the impact of COVID-19. We address common environmental concerns in our practice by:

Our Environment

Energy and Climate

- First waste company in New Zealand to complete an externally audited carbon footprint report and carbon footprint reduction plan. As members of Toitū carbonreduce and initial signatories to the Climate Leaders Coalition, we are 100% invested in progressing towards a low carbon future.

Minimising our Own Waste

- Our office environments have source separated bins (Method Bins) for separating out recycling, paper and general waste.
- We operate paperless where possible and use Microsoft Teams for meetings to minimise travel.
- Single-use plastic items are discouraged and all staff are provided with their own keep cups for making teas and coffees.

Renewable Energy

WMNZ operates four renewable energy parks in New Zealand, namely Redvale and Whitford in Auckland, Tirohia in the Waikato, and Kate Valley in Christchurch (Landfill gas defined as renewable energy as per the GHG Protocol):

- These facilities use award winning gas capture technology to extract the methane generated due to the decomposition of waste and utilise the gas as a fuel for energy generation.
- At present, our four facilities supply enough renewable energy back into the grid to provide 24,000 homes with electricity.

Shift to Electric Fleet and Plant and Equipment

WMNZ has been an early adopter with the shift to electric vehicles (EVs):

- Developed the first in-house truck conversion facility in New Zealand
- 27 fully electric trucks servicing our customers.
- Transitioning our light fleet, with a current total of 92 light EV vehicles being utilised.
- End of life batteries for light EVs and collection fleet are planned to be reused as stationary battery power banks, and charged via solar panels. Our oldest EV is 6-years old with no battery degradation. The battery packs WMNZ use consist of multiple cells that can be changed to prolong the life of the packs.
- In-House Divisional Sustainability Champion for Yellow Gear.
- Electric Materials Handler Machine operating at our Hamilton Resource Recovery Park.
- Sustainable Procurement Policy includes a comprehensive Sustainability Evaluation for plant and equipment, including calculating carbon footprint.

A Solution for Waste Tyres

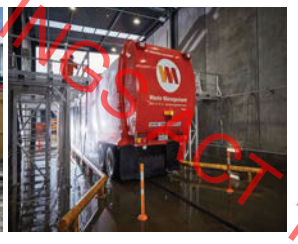
WMNZ's Tyre Processing Facility in Wiri, Auckland alleviates hazards and risks associated with waste tyre stockpiles:

- Assists with creating a coal alternative fuel that is supplied to Golden Bay Cement for turning into TDF (tyre derived fuel).
- **Facts:** TDF provides 20% more energy than coal. Reduces eCO2 per GJ produced by 30%, equating to 600kg eCO2 reduction for every tonne of coal substituted with TDF.

Saving Water Consumption

WMNZ's HQ at 318 East Tamaki Road in Auckland reuses its rainwater through a harvesting system (refer images below):

- Site has two separate rainwater harvesting areas, with seven tanks in total, each holding 25,000 litres of rainwater.
- Truck wash system designed to maximise recovery of the water used, resulting in 70% of the water used being recycled.



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Reporting Against Carbon Reduction Targets

Branch Level

Each of our five divisions have a requirement to report monthly on carbon footprint. Carbon Reporting forms part of divisional monthly business review meetings. WMNZ will provide HCC with a monthly carbon footprint report directly related to our services at Silverstream Landfill.

Company Level

WMNZ's reporting systems are compliant with the Climate Change Response (Zero Carbon) Amendment Act 2019. Compliance monitoring is conducted by our National Sustainability Manager at Head Office (s7(2)(a)) and is accredited via the following channels:

Toitū Carbonreduce Programme

WMNZ is the first waste company in New Zealand to calculate an externally audited comprehensive carbon footprint through the Toitū CarbonReduce programme and to have a carbon footprint reduction plan. This has been approved by our Toitū auditors and our External Advisory Board which will support Mahere Hukihuki Whakaiti **Waro me te Manawaroa ā-Āhuarangi mō Te Kaunihera o Te Awa** Kairangi (Interim Carbon Reduction and Climate Resilience Plan for Hutt City Council). WMNZ reports on its carbon footprint for each site separately on a monthly basis to our internal carbon footprint budgets. Our Toitū Carbonreduce certificate is included in Appendix I.

Each of WMNZ five divisions (Upper North Island, Lower North Island, South Island, Technical Services and Operational and Technical Services) have emission reduction budgets along with monthly carbon footprint reporting, and our Carbon Footprint Reduction Committee meets every quarter to manage and work on our initiatives.

For Future Generations GRI Sustainability Report

Our For Future Generations Report meets the standard of GRI (Global Reporting Initiative) and as a publicly shared document adds a sense of accountability to a company's sustainability credentials and commitments. The GRI Standards are a modular system of interconnected standards. They allow organisations to publicly report the impacts of their activities in a structured way that is transparent to stakeholders and other interested parties.

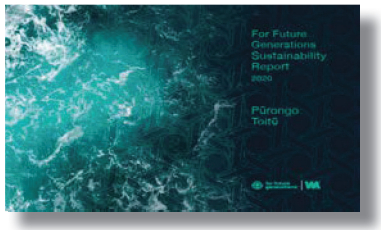

Image: Sustainable Business Network Going Full Circle Report.

Doing our bit to go circular

WMNZ is backing the Sustainable Business Network's Go Circular initiative encouraging New Zealand businesses to do more to shift to a circular economy.

The SBN released a state of the nation report which says progress so far towards a low carbon, circular economy is too slow.

To try and help move things along, SBN launched Go Circular 2025 – a programme that will provide tools and resources for small and medium businesses to help them design out waste and pollution and keep products and materials in use.

SBN is also creating a directory of businesses offering circular economy-based products and services - the goal is to facilitate 25,000 connections a year by 2025.

Increasing demand for more circular solutions is fundamental. This is a role we can all play.

We are getting right behind Go Circular as part of our goal to be leaders in materials and energy recovery. A copy of the Going Full Circle Report can be directly downloaded for viewing here https://sustainable.org.nz/going-full-circle/

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B) Outline Plan for Achieving Reduction in Carbon Emissions for Silverstream Landfill

WMNZ's plan for achieving reduction in carbon emissions directly relating to the transfer and placement of waste for Silverstream Landfill is outlined below:

Indication of Changes for Achieving the Target

Most of the current landfill operation's carbon footprint is due to the type and number of machinery and vehicles used.

WMNZ has identified a saving of 135.20 tCO2e for the current operations by bringing in efficiencies with plant and equipment including an electric loader. For the Transition Phase carbon emissions will rise again due to the additional plant and equipment required to bulk transport waste from customer tip-off point to placement location at the base of Phase 3.

WMNZ has identified a saving of 135.20 tCO2e for the current operations by bringing in efficiencies with plant and equipment including an electric loader.

Going into full Phase 3 operations of the landfill development, WMNZ has calculated that by this phase, carbon emissions would have reduced by 187.60 tCO2e which comes to an overall 29% reduction in carbon emissions well before 2030. On the following pages, WMNZ has reviewed all our proposed plant and equipment for the landfill including expected carbon output for the three Phases.

For Phase 3 Operation we have also provided a Hybrid Option which will further reduce carbon emissions by an additional 53.50 tCO2e. Should hybrid equipment become available in New Zealand before the start of Phase 3,

WMNZ will move to replace the relevant ICE equipment with these hybrid machines giving an overall reduction in carbon emissions of 241.1 tCO2e (37.0%) well before 2030. Carbon emission reduction from contract start through to 2030 is also demonstrated in graphical form on page 52.

Image: 90% of all methane gas at Tirohia is now captured and destroyed.

Modernising Tirohia sees massive drop in carbon emissions

When Waste Management purchased Tirohia Landfill in the Waikato five years ago, we found that 70% of the methane gas produced by decomposing waste was not being captured and was therefore released into the atmosphere. Methane is one of the most potent greenhouse gases in Earth's atmosphere and contributes significantly to climate change.

So we are very proud that today, thanks to our investment and expertise, 90% of all methane gas at Tirohia is captured and destroyed. The site also now has the capacity to convert this gas into energy to feed into the national grid.

It means we are making a huge reduction in carbon emissions. For those with some knowledge of Unique Emissions Factors, Tirohia's emissions dropped from 0.7248 tCO2e/t (tonnes of carbon dioxide equivalent) in 2018 to 0.119 tCO2e/t last year.

In the past year, the Waste Management team at Tirohia has:

- Added extra gas collection pipes into the landfill, and improved existing pipes to capture methane.
- Introduced a larger flare for better destruction of residual methane and also installed additional blowers and a gas conditioning plant which removes all the moisture out of the gas and by doing so increases the engine oil life substantially.
- Installed a new flow metre to better measure and record methane collection.

It all adds up to a massive improvement, which now puts Tirohia on equal footing with Redvale and Kate Valley landfill & Energy Parks – which are widely held to be among the best modern, engineered landfills in the southern hemisphere.

Actual Carbon - Plant and Equipment

Proposed Current Operation

2023 - 2025 | Period 1

Proposed Vehicle/Machinery	No.	Area of Use	Expected Mileage/Usage	Estimated Efficiency (Diesel per/hr)	Estimated Carbon Emission
Mule Truck	2	Landfill Operations	620hours	12.15 litres per hour	20.3 tCO2e
ADT	1	Landfill Operations	620hours	23 litres per hour	38.4 tCO2e
Hook Load Truck	1	Transfer Station	1840hours	4 litres per hour	19.8 tCO2e
Light Truck - Litter (Electric)	1	Landfill Operations	1500hours	0 litres per hour	0 tCO2e
Loader (Electric)	1	Transfer Station	1840hours	0 litres per hour	0 tCO2e
Loader	1	Landfill Operations	2300hours	11 litres per hour	68.1 tCO2e
Compactor	1	Landfill Operations	2700hours	36 litres per hour	261.5 tCO2e
22 Tonne Excavator	1	Landfill Operations	1100hours	11 litres per hour	32.5 tCO2e
40 Tonne Excavator	1	Landfill Operations	1320hours	15.32 litres per hour	54.4 tCO2e
Bulldozer	1	Landfill Cover	500hours	15 litres per hour	20.2 tCO2e
Roller	1	Landfill Cover	60hours	4 litres per hour	0.6 tCO2e
Total	**11**		**14400hours**		**515.8 tCO2e**

Current Operation: Initial carbon reduction by reconfiguring current operating fleet.

Transition to Phase 3 Operation

2026 - 2028 | Period 2

Proposed Vehicle/Machinery	No.	Area of Use	Expected Mileage/Usage	Estimated Efficiency (Diesel per/hr)	Estimated Carbon Emission
Mule Truck	2	Landfill Operations	5096hours	12.15 litres per hour	166.6 tCO2e
ADT	1	Landfill Operations	1000hours	23 litres per hour	61.9 tCO2e
Light Truck - Litter (Electric)	1	Landfill Operations	1500hours	0 litres per hour	0 tCO2e
Loader	1	Landfill Operations	2300hours	11 litres per hour	68.1 tCO2e
Compactor	1	Landfill Operations	2700hours	36 litres per hour	261.5 tCO2e
22 Tonne Excavator	1	Landfill Operations	1100hours	11 litres per hour	32.5 tCO2e
40 Tonne Excavator	1	Landfill Operations	1320hours	15.32 litres per hour	54.4 tCO2e
Bulldozer	1	Landfill Cover	500hours	15 litres per hour	20.2 tCO2e
Roller	1	Landfill Cover	60hours	4 litres per hour	0.6 tCO2e
Total	**10**		**15576hours**		**665.8 tCO2e**

Transition to Phase 3: Increase in carbon from additional plant required to relocate waste, partially offset by efficient utilisation of required equipment.

Phase 3 Operation

2029 - 2030 | Period 3

Proposed Vehicle/Machinery	No.	Area of Use	Expected Mileage/Usage	Estimated Efficiency (Diesel per/hr)	Estimated Carbon Emission
Mule Truck	2	Landfill Operations	800hours	12.15 litres per hour	26.1 tCO2e
Light Truck - Litter (Electric)	1	Landfill Operations	1500hours	0 litres per hour	0 tCO2e
Loader	1	Landfill Operations	2300hours	11 litres per hour	68.1 tCO2e
Compactor	1	Landfill Operations	2700hours	36 litres per hour	261.5 tCO2e
22 Tonne Excavator	1	Landfill Operations	1100hours	11 litres per hour	32.5 tCO2e
40 Tonne Excavator	1	Landfill Operations	1320hours	15.32 litres per hour	54.4 tCO2e
Bulldozer	1	Landfill Cover	500hours	15 litres per hour	20.2 tCO2e
Roller	1	Landfill Cover	60hours	4 litres per hour	0.6 tCO2e
Total	**9**		**10280hours**		**463.4 tCO2e**

Phase 3 Operation: Significant reduction in carbon with return to normal operations and cessation of waste cartage. Realisation of previous benefits now visible.

Phase 3 Operation Hybrid Option

2029 - 2030 | Period 3

Proposed Vehicle/Machinery	No.	Area of Use	Expected Mileage/Usage	Estimated Efficiency (Diesel per/hr)	Estimated Carbon Emission
Mule Truck	2	Landfill Operations	800hours	12.15 litres per hour	26.1 tCO2e
Light Truck - Litter (Electric)	1	Landfill Operations	1500hours	0 litres per hour	0 tCO2e
Loader	1	Landfill Operations	2300hours	11 litres per hour	68.1 tCO2e
Compactor	1	Landfill Operations	2700hours	36 litres per hour	261.5 tCO2e
22 Tonne Excavator (Hybrid)	1	Landfill Operations	1100hours	5.5 litres per hour	16.3 tCO2e
40 Tonne Excavator (Hybrid)	1	Landfill Operations	1320hours	7.66 litres per hour	27.2 tCO2e
Bulldozer (Hybrid)	1	Landfill Cover	500hours	7.5 litres per hour	10.1 tCO2e
Roller	1	Landfill Cover	60hours	4 litres per hour	0.6 tCO2e
Total	**9**		**10280hours**		**409.9 tCO2e**

Phase 3 Hybrid Option: Further carbon reduction possible across all periods with the introduction of hybrid equipment as soon as this becomes available in New Zealand.

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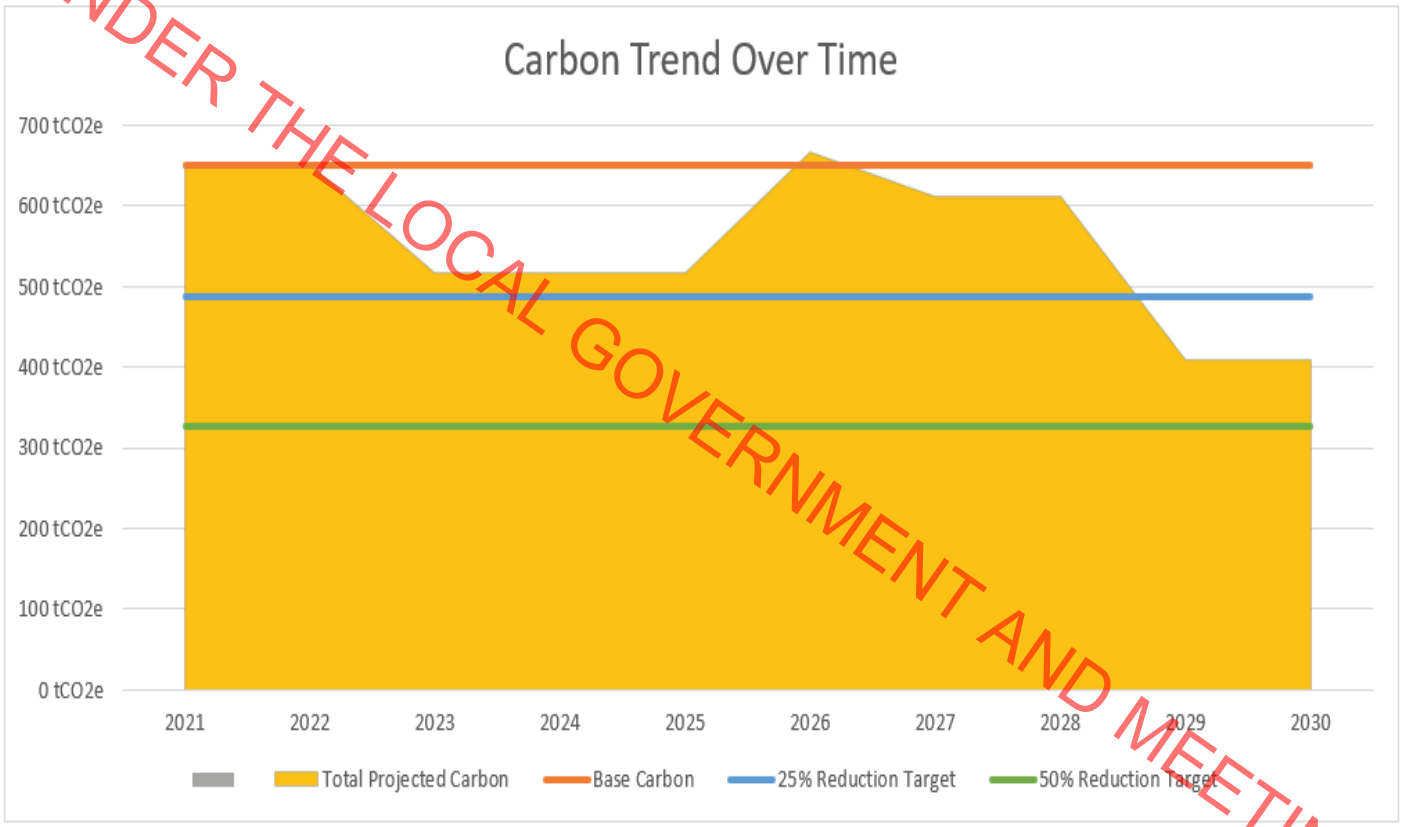
Carbon Reduction Trend Graph



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List of Current Technologies and Timeline to Transition

WMNZ will commit to implementing one electric Loader into the RTS at contract start. This will, however, be subject to availability and suitability assessment and on the outcome of sufficient power supply being implemented into the RTS. WMNZ is in discussions with XCMG on the supply of the electric loader (similar to the image **on right):**

Part of WMNZ's strategy includes always investigating low emission plant and equipment (yellow gear and trucks). We do this by staying abreast of technology and as soon as an electric or hybrid option has proven to be viable and adequate servicing support available, WMNZ will work with HCC on implementing this technology into the operation of Silverstream Landfill.

WMNZ is in discussions with Caterpillar, Komatsu, Liebherr and Volvo and already has initiatives underway with these suppliers including presenting our requirements for reducing operational carbon emissions for yellow gear. This tender process has prompted WMNZ to accelerate discussions and availability with suppliers for accessing this equipment which has historically been slow to reach New Zealand. As a result of this, WMNZ is stepping up our efforts to bring these technologies into New Zealand. To show our commitment to reducing carbon emissions, and in partnership with HCC, we propose to use Silverstream Landfill as the New Zealand first test site for electric and hybrid landfill machines. Landfill machinery we are looking into are tabled below:

Landfill Machines Technology		
Machinery Type and Details	Supplier	Electric/Hybrid
Excavator – 20-40% Lower Fuel Consumption	Komatsu	Hybrid
Dozer D6E	Caterpillar	Hybrid
Dozer D7E	Caterpillar	Hybrid
Wheel Loader – 20T	XCMG	Electric

Timeline for Changes

WMNZ works with all the major suppliers for electric and hybrid technology including EMOSS, XCMG, Caterpillar, Komatsu, Volvo and Liebherr, who are all looking at this technology for electric fleet and yellow gear. WMNZ is proposing to supply one electric loader ready for contract start from XCMG. Other technology including electric and hybrid plant and equipment suitable for a landfill operation could be available in New Zealand within 2-3 years' time. Whilst we are unable to provide HCC an indicative cost estimate at the time of tender, we are working closely with all the major suppliers on costings and availability and will keep HCC informed of developments.

Additionally, it is WMNZ company strategy and policy to evaluate fuel burn and plant and equipment efficiencies when procuring through our capital expenditure process and procedures.

A copy of our procurement policy and CAPEX requirements for this has been included in Appendix J. This demonstrates the level of commitment WMNZ invests into our carbon reduction initiatives and targets and underpins the considerable work done in this space.

It is WMNZ company strategy and policy to evaluate fuel burn and plant and equipment efficiencies when procuring through our capital expenditure process and procedures.

EMOSS FUTURE INSIDE
XCMG
CATERPILLAR
KOMATSU
VOLVO
LIEBHERR
Construction Equipment

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C) Plans and Ideas to Further Decarbonise Operations within the Life of the Contract

In-House Specialised Yellow Gear Sustainability Champion

Most carbon emissions at the landfill directly relate to the plant and equipment utilised for operating it (vehicles and machines). To further decarbonise operations at Silverstream Landfill, WMNZ will work with HCC on the transitioning and implementation electric or hybrid yellow gear as well as investigating the most carbon neutral efficiencies of equipment and operation.

To support this, WMNZ recently established a specialised In-House Plant and Equipment Sustainability Champion who holds a seat within our divisional Sustainability Group that meet on a quarterly basis to discuss the implementation of initiatives as well as review progress against targets.

As electric and hybrid technology becomes more viable and available in New Zealand, our Plant and Equipment Sustainability Champion will work with HCC, s7(2)(a) and s7(2)(a) for implementing this technology into the operations strong relationships with all key suppliers and are always looking at options.

Images: Left to right: XCMG electric loader and Caterpillar Hybrid Dozer.

Increased Materials Recovery and Reduced Emissions from limiting Access to the Landfill

WMNZ are progressing with an RRP site development with waste separation and consolidation capability. WMNZ is proposing a joint approach with HCC to deliver a comprehensive facility with the ability to service Hutt Valley and the wider Wellington region. This facility would enable the immediate delivery of a wider suite of community related aspects and enhance the level of material able to be recovered from the waste stream. The facility would include: a comprehensive recovery and reuse shop, a community workshop and waste education facility, recycling drop off facilities, along with specific stream recovery of: e-waste, metals, tyres, used oil containers, greenwaste, construction and demolition material etc. Integration with any Product Stewardship and CRS initiatives is seen as a core function of the site.

This facility will provide the public with greater access to recover materials that would otherwise end up in landfill and as result will significantly reduce Council's carbon emissions with public vehicles not needing to travel to the landfill to dispose of waste.

Image: Community Reuse Shop at the Hamilton Resource Recovery Centre.

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Alternative to Standard Transporting Waste using Conveyor Belts

WMNZ are currently investigating an alternative to transporting waste down the steep face as specified in the tender documents. The investigations are high level in terms of processing to the next phase as alternatives to reducing carbon footprint. WMNZ are committed to investigating various ways of decarbonising all aspects of waste operations.

The conveyor belt system is built in a concave, modular structure. The conveyor belt system can be assembled easily according to the requirements and be modified later to be adapted to new situations. The system will replace the haul unit (ADT) of transporting waste down the steep slopes. The conveyor belt system is electrically driven and not reliant on fossil fuels.

Image: Conveyor belt.

The external customers trucks delivering waste will be directed to the identified tip pad(s). A loader will load the waste into a hopper that feeds the waste onto the conveyor belt system.

Minor civil works are required for the assembling of the conveyor belt system, a permanent route will need to be identified, and back systems will need to be considered should the conveyor belt system breakdown or should there be a power failure (double system or solar power for generations).

Biodiesel - Z Energy

WMNZ is in discussions with Z Energy with regard to securing access to their biodiesel fuel blend for our plant and equipment. This fuel is expected to carry a price premium, however it would significantly reduce fuel emissions from site operations immediately that could equate to a 5-7% emission reduction associated with fuel burn. WMNZ has a strong relationship with Z Energy and as soon as the fuel is available for use in the Wellington region, we would be interested in utilising this on the Silverstream Landfill if this is of interest to Council.

Image above: Lower North Island Recycling Manager s7(2)(a) in front of the new plastic grinder machine.

Our "powerful new recycling machine" showcased

Kia ora to Lower North Island Recycling Manager Kevin Weir for a stellar job representing Waste Management and our drive towards the circular economy.

Kevin has featured in the Bay of Plenty Times, talking about our new large plastic grinder, which is now operational in Tauranga.

The grinder is currently processing 3,000 wheelie bins a week, grinding them into 40mm pieces to be melted down into resin for reuse.

The Bay of Plenty Times reports:

Without a grinding machine of sufficient size, workers had to cut the bins down manually with sabre saws and skill saws.

Weir said this was "unsafe" and "time-consuming".

"So, we thought, 'what can we do to help?' And to make sure that we can actually properly recycle in a cyclic economy.

"The traditional linear economy where you 'take-make-dispose' is not something we promote."

The machine has received the thumbs up from Sustainable Bay of Plenty chief executive Glen Crowther and Tauranga City Council's sustainability and waste manager Sam Fellows.

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HUTT CITY TE AWA KAIRANGI

Tō tātou tāone
Our city

Methodology and Resources (15%)

Attachment C | Non-Price Attribute Evaluation Criteria

(B) COMPARATIVE CRITERIA

Image: Tirohia Landfill and Energy Park, Waikato

Methodology and Resources (15%)

A) Client Liaison (Including Approach to Team Working)

s7(2)(a) as Contract Manager will be responsible for the timely and cost-effective delivery of these contracts. s7(2)(a) has established relationships with personnel from HCC and contractors delivering to Silverstream and has proven capability in health and safety, environmental and quality performance.

s7(2)(a) as Contract Manager will be responsible for the timely and cost-effective delivery of these contracts. s7(2)(a) has established relationships with personnel from HCC and contractors delivering to Silverstream and has proven capability in health and safety, environmental and quality performance.

WMNZ's Landfill Manager, s7(2)(a), will be the Cou contact for the overall site operation. s7(2)(a) will ensure that the landfills first line staff (weighbridge and kiosk operator and transfer station staff) are well-selected and trained to offer a high-quality, friendly, and efficient service to the members of the public.

s7(2)(a) will be charged with setting es and policies to facilitate effective operation of the Landfill. s7(2)(a) will be supported by Silverstream Ope s Supervisor, s7(2)(a), and other competent s xperienced in Landfill Operation and Maintenance. The current staff working at the landfill has substantial experience in plant operation and maintenance on all aspects of the landfill's activities.

s7(2)(a) has been associated with WMNZ for approximately 24 years. Prior to joining WMNZ, s7(2)(a) had many years' experience with the Asset Management Group of HCC.

s7(2)(a) is s7(2)(a) 'second in command'. s7(2)(a) is compe and knowledgeable in management functions, systems and contractor responsibility. s7(2)(a) has an adva level of knowledge of landfill operations and hazardous waste disposal management. s7(2)(a) has considerable experience in landfill compactor and bulldozer operation as well as being a competent digger and truck operator.

B) Overall Outline Methodology to be Adopted for Operation of the Landfill

Building on current excellent practices, our proposal is to improve waste diversion, safety, and customer experiences at the Silverstream Landfill and Transfer Station. At Silverstream, we intend to work with you to ensure the community is engaged and waste to landfill is minimised every step of the way. Based on our extensive knowledge of the site, and our skilled and experienced team already embedded, we will be able to effectively and safely manage the coordination of all activities on Silverstream including during the staged transition process to the new development of the landfill.

Proposed Systems for Provision of the Landfill as a Service to Customers in the Hutt Valley

WMNZ's systems currently utilised at the landfill is outlined in the below table:

Customer Care/ Management	WMNZ endorses the emphasis that HCC places on positive relationships with members of the public, and will actively encourage and promote achievement of this objective through: 1. Training staff in good public relation habits. 2. Auditing staff against WMNZ's customer interfacing guidelines. 3. Providing ongoing "refresher" courses. 4. Employing staff that are courteous, helpful and professional in attitude. Customers entering the Landfill area will stop at the weighbridge kiosk for classification and recording of loads, and payment, they will be directed to the appropriate disposal area, transfer station or commercial truck pad. Drop-off bays are clearly marked with signage for transfer station customers. All Landfill staff are trained and have the ability to interact, educate and direct customers when or where required. Whilst EFTPOS is the preferred method of payment it is recognised that cash will be an option that needs to be catered for. Measures that will be implemented to manage cash include: • Promoting the use of EFTPOS wherever possible. • Daily pre-preparation of the float to keep levels of change at the required level. • Daily reconciliation of cash and EFTPOS takings. • Removing cash from the site for banking via a cash collection provider.

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Communications	All Landfill staff have personal radio devices to communicate with each other. The Landfill Operations Manager holds ultimate responsibility for providing regular communications to staff that include health and safety matters, such as toolbox meetings, as well as any proposed works to be undertaken. He is the single point of contact for communicating with HCC and Tonkin & Taylor. The weighbridge staff are the first point of contact for communicating with customers. This includes any proposed changes in gate fees, resource recovery changes, special waste disposal and any applicable changes to disposal areas on the Landfill site. The Landfill Operations Manager regularly communicates with HCC and Tonkin & Taylor through quarterly meetings and monthly contract compliance reports.

Account Management	Account Management is administered by two Silverstream Landfill administration personnel. The administration staff monitor and manage all landfill customer accounts, including reconciling daily kiosk transaction reports, managing payments for invoicing, and developing the monthly financial report that is provided to HCC. The system utilised for managing customer accounts is called Weightrax. The administration personnel have responsibility for providing HCC with the monthly financial report.

Invoicing	Weightrax is installed on the Silverstream Landfill weighbridge and captures tonnages in and tonnages out. Data from Weightrax is utilised for the monthly financial reports provided as well as invoicing. Invoicing is managed through Xero.

Waste Handling (including special wastes) and Placement (including placement of Daily Cover and Landfill Capping

Handling of General Refuse

General refuse makes up the bulk of waste entering Silverstream Landfill. General refuse received from commercial vehicles and from the transfer station is brought into the Landfill unloading zone where it is unloaded and pushed into a specific area. The refuse compactor collects the waste and proceeds to place and compact it into the designed lined area on the Landfill.

Handling of Special Waste

HCC has a Waste Disposal Guide to assist in defining each waste category. WMNZ are very familiar with working with this Waste Disposal Guide. Special Waste is defined as that which requires special handling, pre-treatment or testing before it can be accepted and disposed of. Acceptance for contaminated and some special waste are authorised by Tonkin & Taylor engineers with WMNZ input.

All customers must have a Tonkin & Taylor authorisation for any special or hazardous waste disposal.

Handling of special waste is determined on the nature of the waste. Some special waste may be handled by different machinery but will be placed in the designed refuse filling zone unless directed by the Tonkin & Taylor engineers.

Placement of Waste

General refuse is pushed in layers of no more than 600mm in thickness. The refuse compactor drives over the refuse with a minimum of 5 passes to achieve optimum compaction.

Special waste includes but is not limited to wastewater treatment sludge and sewerage treatment sludge, which is disposed of and mixed in with the general waste in small quantities to avoid a quagmire occurring. Special waste such as large tree stumps, construction and demolition waste and other solid waste is often lifted into position with an excavator or placed at the toe of the refuse pile with general waste placed on top. Other special waste such as contaminated soils, are stockpiled within the landfill zone under guidance or instruction from Tonkin & Taylor engineers.

General refuse is pushed in layers of no more than 600mm in thickness. The refuse compactor drives over the refuse with a minimum of 5 passes to ensure optimum refuse compaction is achieved.

Image: Placement of waste, Silverstream Landfill.

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Placement of Daily Cover

Daily cover will primarily comprise of natural earth material obtained from the designated borrow areas excavated and transported to the tip face with ADT dump trucks or an Astra 8-wheeler (Mule Truck similar to image right). Sufficient material will be stockpiled adjacent to the refuse to enable the placement of daily cover at closing time each day of landfill operations.

Image: Astra 8-wheeler (Mule Truck).

It will be the responsibility of landfill operations management to ensure that an adequate supply of soil cover is available and accessible at all times, either from stockpiles or borrow areas. This issue will be important in winter when the non-landfill parts of the site may become inaccessible due to severe softening of wet ground.

Alternative Daily Cover

The use of alternative daily cover will not be excluded if it can be demonstrated that an alternative will perform as effectively as soil cover for compliance with respect to nuisances, stability, and environmental effects, subject to consultation with and obtaining approval from HCC.

Landfill Capping

Capping of the landfill is completed when the refuse levels have reached design limits. The capping will either be intermediate or final capping. The capping material is earth won from the defined borrow areas, and the material will be excavated and carted using the appropriate earth moving machinery. The earth will be placed in layers and compacted to the design relevant for each capping, i.e. intermediate or final.

A final compacted soil capping layer of at least 1.2 metres will be applied to each completed landfill stage as instructed by engineers when the landfill area is complete.

Control of Compaction Effort to Achieve Specified Compaction Targets

Compaction improves the stability of the waste mass, minimises the airspace and land used for landfilling, minimises cover requirements, and minimises the formation of voids that encourage vermin, reduction in fires and increase leachate generation. The waste will be compacted efficiently and safely with specialised heavy mobile compaction equipment. Equipment will be selected with due regard to efficiency and environmental factors such as noise and emissions.

For efficient compaction, the refuse layers will be lineal flat. Waste will be spread as thin as practical, less than 0.6m. The waste will be compacted and formed to fill the void to the filling period and plan.

General waste containing bulky refuse items will not be placed in the final lift to avoid puncturing the final cap after settlement, unless a specific blinding and separation layer is formed.

Special waste which has significantly different compressibility properties from the surrounding general waste (e.g. compressible or stiff) will not be placed within 3m underneath final cover to avoid sharp differential settlement which could affect the integrity of the cap.

For efficient compaction, the refuse layers will be lineal flat. Waste will be spread as thin as practical e.g. less than 0.6m for compaction.

To control compaction for achieving the specified targets, WMNZ machinery contains a GPS device to advise the operator when optimum compaction has been achieved.

Compaction Equipment

WMNZ will provide sufficient plant and competent staff to carry out the compaction process of refuse and achieve the optimum refuse density of 1t/m3. A purpose-built designed refuse compactor machine no lighter than 35 tonnes will be utilised for compaction of refuse. This machine may have technology installed that will provide the operator that optimum refuse compaction has been achieved. In addition, Tonkin & Taylor will provide topographical survey data to inform compaction analysis and reporting to HCC.

Image: Refuse Compactor.

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Demonstrated Understanding and Operational Methodology for Phase 2 and 3 of the Landfill Operations

WMNZ is currently contracted to carry out operations and maintenance at Silverstream Landfill and Silverstream Public Drop Off Facility.

Through our experience at the Silverstream Landfill (one of the highest volume landfill operations in New Zealand), WMNZ has both current and relevant experience in operating both large and small landfills in New Zealand. As current operators of the Silverstream Landfill, WMNZ are familiar with local topographical and drainage considerations, the importance of public perception and safety, and potential volumes of waste entering the landfill site.

WMNZ visited the Silverstream Landfill site on 4 May 2022. We understand the proposed scope and works for Phase 2 and 3 of the landfill operations and outline our understanding and operational methodology below:

Phase 2

Waste will be delivered as per normal from the various landfill customers and from the on-site Transfer Station.

Waste will be delivered as per normal from the various landfill customers and from the on site Transfer Station.

The waste is unloaded (tipped) onto a truck (tipping pad) then pushed using a large front-end loader toward the refuse compacting machine. The Refuse Compactor spreads the waste in uniform layers for compaction and shaping.

Daily cover material will be stockpiled adjacent to the refuse and placed at the close of each day using existing equipment which includes an excavator, ADTs, Mule Truck, bulldozer, and front-end loader. At the start of each day, the daily cover will be peeled back to integrate the new waste with the old and to reuse some of the earth cover.

When applying waste adjacent to the liner (fluffy /soft waste) will be chosen from the waste stream and placed using an excavator to a reasonable thickness (2m) prior to the Refuse Compactor manoeuvres.

Accordingly, intermediate earth cover will be placed when required and with coordination from the engineer.

Phase 3

Once the installation of the first cell liner of Phase 3 is completed and approval is received from the engineer to proceed to place waste, the Protection Geotextile will be installed on top of the liner, following specification item 10.5, (Installation). This will be followed by the installation of the Geogrid Reinforcement (only on the wall and steep battered sections).

Once the installation of the first cell liner of Phase 3 is completed and approval is received from the Engineer to proceed to place waste, the Protection Geotextile will be installed on top of the liner, following specification item 10.5, (Installation).

A 300mm drainage gravel layer (leachate collection layer) will then be carefully placed on top of the protection geotextile and geogrid using a suitable excavator, taking care not to let any drainage gravel roll onto the unprotected liner.

Once the drainage gravel is placed, the separation geotextile will be laid on the gravel (floor section only), followed by a waste fluff layer (selected soft or roadside collection waste) of a minimum depth of 1m (as per T+T's drawing 82948.1000-042, Detail-J), using an excavator. Spreading and compacting will be done by means of a refuse compactor.

Daily cover material will be stockpiled adjacent to the refuse during the day and placed over the waste at the close of each day using, as needed, an excavator, ADT or mule truck, bulldozer, and front-end loader.

At the start of each day, the previously placed daily cover will be peeled back to integrate the new waste with the old, also reusing some of the cover at the end of the day where possible.

Once the fluff layer has been compacted appropriately, general waste can be placed over the layer.

Waste, loaded onto suitably sized mule trucks with a front-end loader, will be hauled from the Phase 3 transfer pad to the Phase 3 tipping pad.

The tipped waste will be pushed and leveled onto the fluff layer by means of a front-end loader. A suitable Refuse Compactor will then spread the waste in uniform layers for compaction and shaping.

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Transitioning – Phase 2 and 3

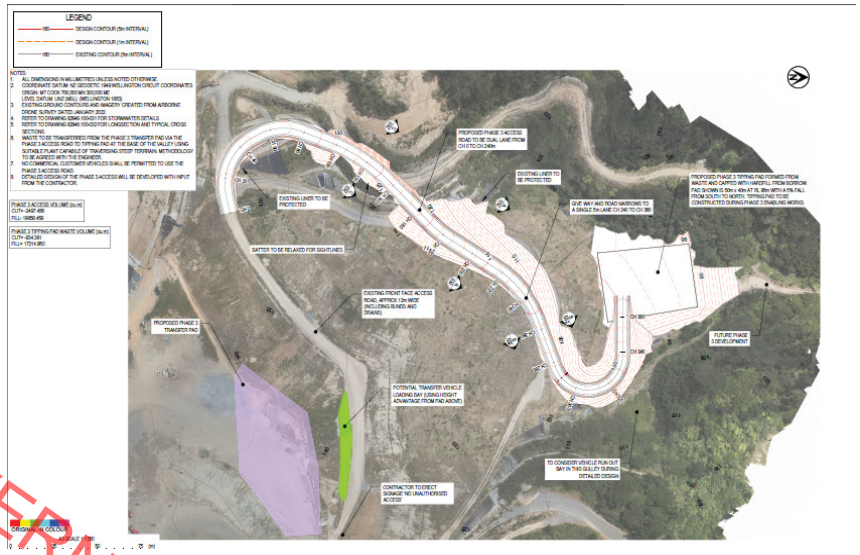
Once construction of the Phase 3 liner and access road has been completed, WMNZ's approach is to have three tipping pads: tip pad at Phase 2 to continue filling the remaining airspace of Phase 2, the proposed Phase 3 transfer pad, and a Phase 3 tipping pad as per T+T's 30% Phase 3 Access Design (reference Drawing 82948.1000-030 & 31 shown right).

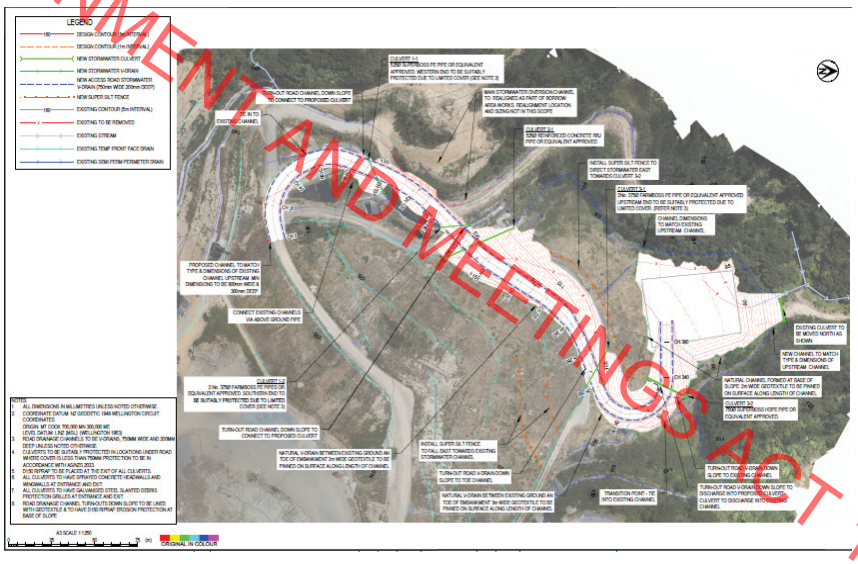
If the transfer station is still operating on-site, waste from the on-site transfer station will be taken to the proposed Phase 3 transfer pad using a Mule truck to move the open-top bins and empty the bins onto the transfer pad.

Commercial trucks will deliver waste directly to either the Phase 3 Transfer Pad or the Phase 2 Tipping Pad as directed by the Kiosk operator who will liaise with the landfill staff regarding which pad to use.

Waste delivered to Phase 2 Tipping Pad will be spread, leveled, and shaped by either using a Dozer or a Refuse Compactor in layers suitable to the desired density.

Once construction of the Phase 3 liner and access road has been completed, WMNZ's approach is to have three tipping pads. A tip pad at Phase 2 to continue filling the remaining airspace of Phase 2, the proposed Phase 3 transfer pad, and a Phase 3 Tipping pad.





Waste delivered to the Proposed Phase 3 Transfer Pad will be loaded with a loader onto ADTs and hauled to the Phase 3 Tipping Pad. Once the waste is tipped onto the pad it will be spread and compacted by a Dozer and Refuse Compactor across the lined Phase 3 cell.

Due to the overlap of activity, such as Phase 2 and Phase 3 Tipping Pads being managed simultaneously, additional plant and equipment will be required. This has been outlined on page 72 and 73.

Operation of the Weighbridge, Kiosk and Transfer Station

Weighbridge

The landfill will use an attended weighbridge during operating hours with split shift operators.

Weighbridge Purpose

The purpose will be to:

- Restrict entry only to authorised persons and vehicles.
- Issue information and site rules to new drivers.
- Verify that the waste (either declared by the driver or visible to the attendant) is authorised under a specific waste acceptance contract.
- Assess the nature of all waste coming to the landfill.
- Encourage customers to use the diversion facilities before disposal.
- Receive only Approved Wastes.
- Collect fees set from time to time by HCC.
- Inform customers of safe ways of disposing of their wastes.
- Provide all customers with appropriate information regarding options available for waste disposal including re-use and recycling.
- Operate the Weightrax system recording vehicle registration, waste category and weights of all incoming and outgoing loads, plus checking landfill fees are correct.
- Advise tip face operators of the arrival of waste which may have special handling instructions (e.g. health and safety, potential odour, customer-requested supervision).
- Call on the Landfill Operations Manager or Supervisor to accept any unacceptable wastes.
- Reconcile transactions with payments received.
- Record details of non-compliance with site rules by hauliers and warnings issued (e.g., load not covered, load excessively dusty without prior declaration).
- Attend to housekeeping at the weighbridge and weighbridge office.
- Carry out other miscellaneous activities as required.

Kiosk

For operating of the weighbridge kiosk, WMNZ will provide suitably trained staff and ensure that kiosk attendants are available on the premises at all times that the Landfill is open to the public. The attendants will wear a personal identification badge. WMNZ will provide a split shift day for the attendants. WMNZ appreciates that the kiosk is the gateway to the landfill. Kiosk Attendants will therefore be trained in customer interfacing where greetings and directions will be friendly and polite. Kiosk staff will be equipped with RT devices for communication between operators at the landfill face and the Landfill Operations Manager.

Image: Inspecting loads at Silverstream weighbridge.

Managing the Kiosk

- Acceptance of refuse - The Kiosk Operator will ensure incoming refuse to the landfill complies with the landfill waste acceptance criteria. The Kiosk Operator will accept load manifests and check to see they are correctly filled in and check that waste requiring special handling has arrived at the agreed time and alert the operators at the landfill face.
- Insecure loads - All incoming loads will be inspected to ensure they are securely tied down. The Kiosk Operator will be the first point of contact for advising drivers of vehicles with insecure loads requiring the loads to be securely fastened.
- Recording - The Kiosk Operator will weigh all commercial vehicles entering and leaving the landfill utilising the Weightrax technology installed on the weighbridge. The weight, refuse description and vehicle type is entered into “Weightrax" for keeping landfill records.
- **Landfill fees** - The Kiosk Operator will be responsible for the collection and management of landfill fees. No cash will be kept overnight, and daily banking will occur.

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Transfer Station

On entry to the Transfer Station, customers will be encouraged to follow the waste minimisation hierarchy of:

- Re-use (Earthlink – inorganic materials).
- Greenwaste.
- Cardboard.
- Whiteware and E-waste.
- Hazardous liquids, paints, oils, gas bottles etc.

Members of the public will deliver their waste in cars and trailers, boot loads or utility vehicles directly to the transfer station.

Image: Transfer Station, Silverstream Landfill.

Adequate staffing will be provided for the safe, efficient, and environmentally responsible management of the Transfer Station and to maintain accurate records of diversion of waste where possible.

Staff will receive training in the identification of hazards, WMNZ health and safety systems, good operating practices, safe machine operation, the conditions of resource consents, environmental requirements, customer service, and good housekeeping. The aim is to develop a multi-skilled team that will facilitate rotation and develop a good understanding of the overall objectives to recover, re-use and recycle ahead of disposal, of customer needs and the waste streams that can be diverted before reaching the Transfer Station.

A senior Landfill Operator, reporting to the Landfill Team Leader, has been appointed to supervise activities at the Transfer Station. An operator will clear the floor of the transfer station using a loader to place material into hook truck bins for hauling residual waste to the landfill. A spotter and concierge will direct traffic movements, watch out for and stop unsafe acts, recover recyclable materials, assist customers where required, and attend to general house-keeping duties.

Intervention to maximise re-use or recycling (scrap metal, whiteware, cardboard, Earthlink inorganic material, hazardous liquids, paints, oils and the like) will be undertaken before the waste ends up in the Transfer Station Pit, with the last opportunity being at the unloading apron.

WMNZ will work collaboratively with HCC and Tonkin & Taylor to prioritise and implement agreed improvements through a structured programme.

Maintenance of Landfill Assets

In collaboration with Tonkin & Taylor, an update and review of the condition of all Landfill Assets will be undertaken on a monthly basis. This review will inform the current condition of landfill assets and record any maintenance carried out during the previous month. Advice on breakdowns, poor asset condition and performance is immediate for critical safety or environmental assets, with prompt and timely response in relation to addressing and rectifying done either through WMNZ or by separate Contractor. For less critical items these are communicated at the regular operations meetings:

Roads	The condition of the roads will be inspected regularly, and provision made in work plans and annual operating budgets to maintain good drainage, repair potholes in the sealed surfaces as they appear, and maintain a good quality running surface.
Kiosk and Weighbridge	Kiosk operators maintain the facilities, and the weighbridge is self-maintained. Scales are verified and checked via an outside contractor, and maintained once a year.
Transfer Station	Staff are responsible for maintaining an accessible transfer station which is ongoing on a daily basis, including a road sweep, and daily pre-start checks, CAM (Capital Asset Maintenance Programmes) is used for maintenance of assets.

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Drainage and Leachate Systems	There will be daily checks of the drainage and leachate system for any blockages or leachate breakouts. Any fault or failure of the system found on the daily checks are reported to the Landfill Operations Manager. For minor maintenance items, these are undertaken by WMNZ landfill staff. The Leachate Grit Trap is inspected on the daily route and the sediment is cleaned out annually as well as stormwater catch pits. No leachate or contaminated stormwater is allowed to discharge outside of the leachate collection system directly into the environment. All leachate must be directed into the collection system. The Tonkin & Taylor environmental team employed at the site are responsible for major maintenance of the drainage and leachate systems. Additional field support will be provided by WMNZ as required.

Erosion and Sediment Controls	There will be regular audits of the site with Tonkin & Taylor engineers. Erosion and Sediment Control measures will be installed as agreed for example: • Silt fencing. • Earth bunding. • Silt traps. • Hydroseeding.

Main Silt Pond	The main silt pond is a deep and large body of water to enable silts to settle, creating less discoloration of stormwater entering the downstream water course. Maintenance of the main silt ponds forms part of the site daily check process to ensure the pond is not contaminated with a significant leachate breakout. Landfill staff regularly maintain the upstream water course to ensure it is clear of litter so that no debris flows into the main ponds. If the ponds require removal of silt, this is undertaken by a specialist subcontractor engaged by Tonkin & Taylor.

Dam Assets	Dam assets are covered by the daily site check process. A visual check of the dam facility is undertaken. The grass covering the dam is kept at a short length with a bi-annual scrub bar cut. Water levels are checked at the silt pond.

Interfacing with and Directing Landfill Customers

The ability of the landfill to be operated in an effective and efficient manner is related to the competency of the WMNZ personnel currently employed.

All WMNZ staff working on site or with site responsibilities are required to undertake a formal site induction process.

All staff that WMNZ propose to operate and manage Silverstream Landfill possess extensive previous experience, with the technical skills required to interface with and direct landfill customers.

The ability of the landfill to be operated in an effective and efficient manner is related to the competency of the WMNZ personnel currently employed.

Public and Public Relations	WMNZ staff are required to maintain a high standard of public relations. All dealings with landfill customers and visitors must be conducted in a courteous, helpful and professional manner. Staff directly involved in dealing with the public and providing public relations include: • Landfill Operations Manager. • Landfill Supervisor. • Weighbridge and kiosk attendants. • Transfer Station staff. • Landfill Operations team.

Commercial Customers	Delivery of wastes directly to the landfill will be restricted and limited to selected large commercial customers and those customers delivering wastes that require special handling. Smaller commercial customers and members of the public will be directed by the kiosk attendant to offload residual waste at the Transfer Station. Delivery to the Transfer Station will: • Allow for risks to the safety of customers to be appropriately managed. • Provide a clean environment for members of the public to offload waste.

Image above: s7(2)(a) Silverstream Landfill Kiosk Attendant.

Friendly first impressions of Waste Management

The way you greet people is hugely important, and often leaves a lasting impression of Waste Management and the professionalism of our team.

s7(2)(a) who has worked at Silverstream Landfill as kiosk attendant for six years, recently received some amazing feedback from a customer on social media.

The post said:

"The lady who works at Silverstream… top lady. Went out of her way to help me with a small incident. She didn't have to do what she did. Made my day!"

Prior to joining Waste Management, s7(2)(a) worked as a receptionist Government for many years. Waste Management has been a change of pace, but s7(2)(a) enjoys the comradery and friendliness of the drivers she talks to every day.

s7(2)(a) has demonstrated Waste Management's values of Community Commitment and Care & Responsibility.

Health and Safety instruction/ induction	WMNZ operates Silverstream Landfill under a Health and Safety Management Plan. Within this plan is a process for health and safety instruction/induction to the site. A Site Information Sheet is provided to visitors, service personnel and contractors with safety information regarding accessing, visiting and/or working at Silverstream Landfill. It is a Condition of Entry that visitors, service personnel and contractors be inducted to the site and follow all safety policies, procedures, controls, notices, signage and instructions while at Silverstream Landfill. We have included a copy of the Health and Safety induction process and information sheet in Appendix K.

Invoicing and Financial Management	All vehicles arriving at the Silverstream Landfill drive through the weighbridge kiosk where transactions are recorded in the Weightrax system. All transactions are reconciled at the end of each shift by the kiosk attendant. Cash is deposited into a safe after which a security firm collects and banks the cash. At month-end a total reconciliation is completed. Data from Weightrax is utilised for the monthly financial reports provided as well as invoicing. Invoicing is managed through Xero.

Interfacing with Other Key Landfill Suppliers

It is very important that the landfill operations cohabitate and communicate regularly to ensure the effective and safe operation of the landfill entity, including the daily operations of refuse acceptance and landfilling, capital works construction, landfill gas capture and future engineering.

It is very important that the landfill operations cohabitate and communicate regularly to ensure the effective and safe operation of the landfill entity.

A number of key organisations are involved to effectively manage Silverstream Landfill, which are:

- Hutt City Council (Owners)
- WMNZ (Daily Operations)
- Tonkin & Taylor (Engineers & Monitors)
- LMS (Methane recovery & power generation)
- EarthLink (Op Shop Recovery)
- Leach Contractors (Capital Works)

Each of the organisations above are PCBUs (Person Conducting a Business or Undertaking) and have responsibilities and duties to ensure that people and the environment at Silverstream Landfill are kept as best as possible from any harm. The PCBU's have monthly meetings to report and record health and safety and environmental matters. The Landfill Operations Manager coordinates and manages the relationship with other key landfill suppliers.

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Communication with Contractors involved or operating at Silverstream Landfill but not engaged by WMNZ (e.g. Tonkin & Taylor, Leach & Co, LMS, etc) is through coordinated meetings, and other meetings as required.

Storage and Submission of Records

Details of all wastes (general and special) will be captured by computer-based data management at the weighbridge, at least to the extent required to provide the summaries for reporting to HCC.

Details of special wastes will also be collected and obtained from the Special Waste Disposal forms, which identifies greater detail regarding the source and nature of the waste and the customer location.

Details of all wastes (general and special) will be captured by computer-based data management methods at the weighbridge.

Acceptance of non-standard or project specific special or hazardous wastes should only be done by the weighbridge operators if HCC's assessment and acceptance for landfill documentation is available.

All transactions at the weighbridge are recorded on the computer database under appropriate categories. Details of all transactions as recorded by the Weightrax weighbridge software, including vehicle identification, vehicle counts, weights of wastes, and monies received, are downloaded each day. Operations of the weighbridge and Transfer Station are subject to continuous checks, and cash register records checked against banking daily.

Constructional, operational and monitoring records will be kept either in a building on the site or in a suitable off-site place. It is anticipated that most of the records will be in electronic form, stored on a file server computer in the site administration office. These files will be backed up on a daily basis (operational weekday), and the backed-up files will be stored on a suitable medium in a secure place, such as removable hard drive, company network or tape kept in a safe in another building.

Traffic Control on and Around the Landfill

Traffic control will be instigated as required for safety and for keeping vehicles to defined road surfaces to reduce nuisances (dust, mud, noise). Appropriate signage will be prominently displayed to direct customers to the various areas of the landfill. WMNZ has an existing Traffic Management Plan that guides and governs all traffic control procedures on and around the landfill, including processes for keeping commercial vehicles separate from the public. A copy of this has been included in Appendix L.

Barricades and temporary fences will be erected where necessary to make excavations safe and ensure that customers can traverse the site and dispose of their waste in safety. The landfill team operating the site (kiosk operators, landfill operators, litter control staff and team leaders) are all suitably trained and experienced to direct landfill customers and others to their appropriate destination and provide warnings on where not to travel.

Speed Limit

Speed restrictions shall apply to all vehicles using the roadways and parking facilities at the site. The speed restrictions applying to the site are:

- 30km/h for vehicle traffic areas unless otherwise specified (e.g. roadways);
- Walking pace in loading/unloading areas;
- Walking pace in pedestrian designated areas; and,
- Walking pace in vehicle parking area.

Demarcation Zones

Specific zones delineating vehicle operational and pedestrian areas have been clearly defined and designated.

Pedestrian Interaction

Pedestrian interaction within the site has been minimized through the use of a number of traffic control measures, including, but not limited to:

- Public pedestrians not permitted in areas where heavy machinery/mobile plant is operating;
- Children staying inside vehicles (no exceptions);
- High visibility clothing; and,
- Vehicle speed limits.

At times, pedestrians and vehicles will be required to work in the same general area. Where this is necessary, the interaction will be managed by means of a safe process, including, but not limited to:

- Mobile plant and pedestrian demarcation zones.

All personnel working in and entering operational areas of the site are required to wear high visibility clothing or hi-visibility vest. Visitors will be provided with a hi-visibility vests prior to entering operational areas by their company representative. These vests shall be returned when leaving the site.

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Signage

Appropriate traffic control signage is displayed throughout the site. These signs serve as a constant reminder to all vehicle operators and pedestrians of conditions and requirements when accessing various areas on the site. All signage requirements are reviewed and audited annually and checked during workplace inspections.

Lighting and Visibility

Lighting has been specifically designed to ensure that vehicle and pedestrian operations are visible at all times. Vehicles on site use their lights at all times whilst operating and where fitted, flashing orbital lights and reversing alarms are operated.

C) Demonstrated Understanding of Council's Key Objectives

Contributing to the Key Objectives

We understand the needs of HCC and, like you, we remain passionate about our role in this community. We know the Council's waste and recycling aspirations and are keen to take our relationship to a new level of effectiveness and efficiency.

Experienced and Motivated Partner

Our track record from delivering consecutive HCC contracts demonstrates high levels of customer service and satisfaction, consistently meeting all of Council's Key Performance Indicators. With a strong team of local staff that care about our community, you can be confident we have the proven ability to manage a contract of this scale to the very highest standards. This has been highlighted on the commitment to continued delivery of seamless services during Covid-19.

WMNZ has a strong understanding of HCC. As local recycling, waste and landfill operators, we are very aware of Council's Plans and Regulations and fulfill our part in achieving Council's key objectives.

WMNZ has been involved in the waste industry in Wellington for many years, and operates commercial and residential collection services, a recycling plant, and the Silverstream Landfill. We work closely with Council in many areas, notably the public campaign for residents naming the trucks used in the kerbside collection contract.

Environmental Sustainability – including Caring for and Protecting our Environment

WMNZ complies with **ISO 14001:2015** standards throughout all its operations nationwide with comprehensive reporting. Procedures we will use to manage environmental risks and promote environmental improvement on this contract will include:

- Introduce electric yellow gear options as soon as possible into the contract to reduce the CO_2 emissions.
- Greenhouse gas and CO_2 reporting and auditing as a KPI.
- Fully inducted, trained and assessed personnel, including subcontractors, on our environmentally-safe methodologies and requirements.
- Best practice and efficient equipment designed to ensure the clean, effective and contained transfer of waste.
- All trucks, plant and equipment are checked pre-start and on completion for any faults or leaks and all our diesel trucks are equipped with spill kits.

Waste Minimisation and Carbon Reduction

WMNZ is the first waste company in New Zealand to measure its carbon footprint and achieve Toitū accreditation. We have been measuring our carbon footprint for 5 years now. We will continue to take actions each year to reduce our carbon emissions to help reduce air pollution and environmental harm at Silverstream Landfill.

Investing in Infrastructure

Our focus is to deliver HCC with quality services using internationally best-practice operating methodologies at an affordable rate. We can do this through our more than 30 years' experience in landfill management and operation and leverage from our national network to bring in extra resources if required. Silverstream Landfill has been servicing the Wellington region since the late 1970's. Locals have been operating and managing Silverstream Landfill since inception. We would warmly welcome the opportunity to work with HCC and continue this relationship for the next ten years and into the future.

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Contribution to Broader Outcomes

After 22 years of operating Silverstream Landfill, we consider ourselves to be an integral part of Hutt Valley and its economy. We are a well-established operation at the landfill and are especially proud of our engagement with HCC on this contract and on the kerbside collections contract where refuse is being collected by electric vehicles contributing to a lower carbon future for the region.

We spend $2.5m in operating costs locally every year, which substantiates our long-term commitment to the region and provides a very positive impact for Hutt Valley's local economy.

Our annual operating costs deliver revenue to the local businesses that service and fuel our trucks and plant. They also provide our staff with wages that are, for the most part, spent locally. Our staff have a thorough knowledge of the area and are already well-trained and experienced operators. Naturally we look forward to deepening our understanding further under this contract.

We support local businesses and sub-contractors. This contract calls for brand-new equipment including refuse compactor, excavators, ADTs, Mule Trucks, Hook-Load Truck, front-end loaders, rollers and other plant. This increased plant and equipment requirement will result in additional business for our local service contractors. Of the total annual operating expenses detailed above, a significant amount is spent locally on the principal raw material for our business – fuel for our vehicles and equipment.

Transition to Low Carbon Economy

Electric Vehicles

We were the first to introduce 100% plug-in electric trucks into a waste collection fleet in New Zealand, and have a purpose-built facility to assemble more EV trucks. At the end of 2021 we had 26 electric trucks, as well as 92 electric cars and light vehicles in our fleet. We will keep increasing this number and, with a total fleet of over 800, expect to make a significant emissions reduction impact.

Electric Yellow Gear

Our proposal for the operation of the landfill site is centred on maintaining the current highly focused and efficient methodology in place today, and enhancing this with a full refresh of the operating equipment to bring this to current energy efficiency standards. For HCC's consideration, we propose introducing one electric loader at the on-site Transfer Station immediately at contract start and one electric light truck. WMNZ is watching with interest developments in the offering of electric mobile machinery, including loaders and material handlers. As soon as these have proven viability, we will explore offering these as a wider service to HCC.

D) Approach to Delivering Sustainability Outcomes

The Silverstream Landfill Operations Team is directly involved in site level sustainability initiatives including measuring carbon footprint and is required to report monthly into the Lower North Island Divisional Sustainability Champion Team. Initiatives for delivering sustainability outcomes at the landfill are outlined below:

Reducing Energy Use

- Electric Vehicle Charging Facility - In line with other WMNZ facilities, plugs for electric vehicle charging will be provided at the site for light vehicles.
- **Fuel for Landfill Machines** - WMNZ will regularly monitor the use of fuel and effectively operate the landfill machines, so they are not wastefully burning fuel. This will be reported on and provided to HCC in our monthly compliance reports.
- Machinery use - Prioritise the use of high efficiency and energy saving equipment including operational equipment and minimise idling time of mobile plant. WMNZ is proposing to implement one fully electric loader for use at the on site transfer station
- Electricity Consumption - Reduce site power consumption through efficient behaviours and equipment. Complete Electrical Audit and investigate solar options for the site.

Low Impact Water Management

- Silt Pond Water Recycling - WMNZ specialised landfill engineers are able to investigate options for using the silt pond water for dust suppression during summertime; however, WMNZ recognises that the silt pond water would need treatment to remove the suspended silts before reuse.
- Rainwater Harvesting Tanks - WMNZ proposes to investigate options for implementing a rainwater harvesting system off the administration building roof structure for capturing water to wash fleet and for using around the site.

  WMNZ has experience in this and implemented a similar system at our head office in Auckland, where we reuse rainwater through a harvesting system. The site has two separate rainwater harvesting areas, with seven tanks in total, each holding 25,000 litres of rainwater. The truck wash system has been designed to maximise recovery of the water used, resulting in 70% of the water being recycled.
- Monitoring Watercart Use - Water is used daily for the landfill operations. During the summer periods, water is restricted.

Emissions Reductions

Our proposal for the operation of the landfill site is centred on maintaining the current highly focused and efficient methodology in place today and enhancing this with a full refresh of the operating equipment to bring this to current energy efficiency standards and reduced carbon emissions within WMNZ's control.

Our proposal for the operation of the landfill site is centred on maintaining the current highly focused and efficient methodology in place today and enhancing this with a full refresh of the operating equipment.

We have also recently created Divisional Sustainability Champions, senior leaders within each division who have helped establish site-wide carbon budgets and work with site managers to provide practical guidance on the best way to reduce emissions and deliver against budget. The Lower North Island senior sustainability champion will work directly with our Sustainability Manager and the Silverstream Landfill Operations Manager and implement initiatives such as equipment surveys to assess whether specified equipment can be replaced with low carbon-emitting alternatives such as electrical or hybrid equivalents. These measures will help reduce Silverstream Landfill's operational carbon footprint and will support our Carbon Emissions Reduction Plan.

Image: Redvale Landfill & Energy Park, Auckland.

Planned Reporting on Operational Activities

As part of WMNZ's emission reduction plan approved by Toitū Envirocare, we calculate the carbon footprint for over 55 of our sites nationwide every single month. This gives us the ability to monitor our greenhouse gas emission sources in detail across the whole company and throughout the year. From this, reports are generated which are presented to our EMT to track the company's progress on reducing our carbon footprint.

We calculate the carbon footprint for over 55 of our sites nationwide every single month.

This level of carbon footprint monitoring will be setup for the Silverstream Landfill, which will be tracked monthly for each emission source along with the rest of our sites. Along with our regular monthly compliance report that includes metrics for operational activities at the landfill, the inclusion of carbon emission reporting will support meeting HCC's sustainability and carbon reduction commitments and obligations.

Environmental Management

WMNZ confirms that disposal of all waste at Silverstream and all our landfills is strictly in accordance with all relevant resource consents, authorities and other permits and approvals required of the local, regional, or other authority. WMNZ complies with **ISO 14001:2015** standards throughout all its operations nationwide with comprehensive verification reporting. All WMNZ branches are issued with Offensive Trade Licenses. These are tracked through our Business Unit Annual Plans to ensure they are current in each region.

Silverstream Landfill operates under a number of resource consent conditions and WMNZ will provide reporting on consent condition compliance to Council's waste solutions and planning functions.

There will be a strong emphasis on communication within WMNZ and any affected parties from its operations. This will involve regular meetings between relevant stakeholders that could impact on the environment. Meetings will be documented, and where required, actions assigned with ownership and completion dates.

Regular Toolbox talk meetings will formalise issues and ensure the entire team is kept up to date. These issues will be captured on hazard identification sheets and communicated to site visitors upon arrival.

A national environmental incident report is submitted to the Head of Safety and Risk and the EMT on a monthly basis by the health and safety team. Environmental performance is monitored (where appropriate) through the measurement of operational efficiencies, waste generation, water and energy consumption and greenhouse gas and pollution emissions.

The Landfill Operations Manager is responsible for reporting to Council any breach of conditions, such as odour complaints.

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E) Ideas and Approach to Delivering Enhanced Resource Recovery through Delivery of Services

There are limited waste diversion opportunities for domestic users of Council's existing transfer station at Silverstream. In addition, there is currently no infrastructure for diverting/ processing construction and demolition waste.

With the current pit configuration being retained at the Silverstream on-site transfer station, separation of waste for recovery of materials is more difficult to implement.

WMNZ's approach to delivering enhanced resource recovery at Silverstream Landfill will be via the continuation of the following enhancements and as soon as possible transitioning to the removal of the on-site transfer station:

- Staff directing material where there is ability to separate them.
- Implementing separation processes at the RTS on site for example scrap steel. WMNZ would look at implementing a small machine (excavator with grapple) to operate amongst the tip face for scrap steel recovery.

The team who operate the Silverstream Landfill currently, are passionate, local people. Our weighbridge team are excellent operators with a wealth of knowledge, and as the first point of contact into Silverstream their role is crucial for promoting circular economy initiatives to residents who use the facility. They work hard at moving items away from the landfill by working with customers on inspecting their loads, and utilising Earthlink for directing residents to drop off items that can be reused or repurposed.

WMNZ views the combination of the landfill management and the transition to a flat floor resource recovery operation as complementary and a key step in delivering the waste minimisation and sustainability objectives of both HCC and WMNZ. The removal of the on-site RTS and establishment of a new resource recovery facility will allow a move to having only commercial large vehicles only delivering waste to the site, allowing further efficiencies in waste handling and placement to be implemented. This will result in an increase in recovered volumes and a corresponding reduction in volume of waste to landfill.

WMNZ views the combination of the landfill management and the transition to a flat floor resource recovery operation as complementary and a key step in delivering the waste minimisation and sustainability objectives of both HCC and WMNZ.

F) Innovations Beyond Standard Industry Practice

WMNZ partakes in a two-yearly global survey of new and innovative technologies in the waste and resource recovery sectors. We use this information to support our own local initiatives and to ensure that we are bringing the latest opportunities to our customers and partners. We also have a dedicated Divisional Sustainability Champion Team who are tasked with keeping up with innovations and changes with technology and solution that we can pass on to our customers.

In addition to the electrification of our light fleet and the increasing transition of our collection fleet, WMNZ partnered with Regal Haulage to bring the first fully electric Materials Handler into New Zealand to operate the bulk haul truck load out function at our new Hamilton Resource Recovery Park. We will work with HCC on exploring similar solutions at the proposed off-site resource recovery facility and in addition, as new electric and hybrid plant and equipment technologies become more available and viable in New Zealand, we will work with HCC on a transition programme for the future operation of Silverstream Landfill.

WMNZ will take a partnership approach to finding the best and most effective solution to specific HCC issues and objectives, so that a genuine and deliverable benefit can be found and implemented.

Image: Electric Materials Handler, Hamilton Resource Recovery Park.

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G) Value-Added Services or Infrastructure

WMNZ believes that there are further gains to be made in both operating efficiency and the safe development of the landfill by including the engineering and development function for the landfill within the structure of a new operating contract. With a world class team of landfill engineers operating in-house in our Operations and Technical Services (OATS) division we believe a fresh approach to the next development stage(s) for Silverstream can be used. This will ensure waste placement, gas capture and control, water and leachate management, and site development costs can be optimised to offer a better overall outcome for HCC.

WMNZ believes that there are further gains to be made in both operating efficiency and the safe development of the landfill by including the engineering and development function for the landfill within the structure of a new operating contract.

WMNZ's ability to draw on its expertise and resources as New Zealand's most experienced and largest waste and landfill operator will give the Council confidence that waste facilities are well run. While the Silverstream Landfill and Transfer Station will be managed at a local level, this team will continue to have access to significant expertise, technical resources and training from within the company along with the benefits of sharing best practices and the ability to benchmark with a range of other sites.

WMNZ have an internal landfill working group where representatives from all our landfills are brought together regularly to share learnings, upskill the team, and promote and challenge best practice in our field. The local team in Wellington, and as a result the operations at Silverstream Landfill, will contribute to benefit through continuous improvement and benchmarking relative to other WMNZ facilities in New Zealand.

H) Compliance with Landfill's Resource Consents, Specification and Landfill Management Plan

WMNZ has long term experience operating Silverstream Landfill in partnership with HCC and Tonkin & Taylor engineers who administer the Resource Consents, Specifications and develop the Landfill Management Plan.

Adequate levels of staffing will be provided to ensure that during operating hours all continuous tasks (including acceptance, compaction and covering of the landfill) are completed in accordance with Resource Consents and the Landfill Management Plan. Staff will receive training in the identification of hazards, WMNZ health and safety systems, good operating practices, safe machine operation, the conditions of resource consents, environmental requirements, customer service, and good housekeeping.

Tonkin & Taylor are engaged by HCC for engineering and monitoring compliance with Resource Consent reporting requirements. Silverstream Landfill operates under 14 Resource Consents. The Resource Consents are documented in the current Silverstream Landfill Stage 2 Landfill Management Plan. WMNZ reports to Tonkin & Taylor engineers on compliance for operation of the landfill.

I) Management of Employees, Subcontractors and Others

Silverstream Landfill is a Council-owned landfill with WMNZ as the principal contractor to manage operations. Key personnel have been running the Silverstream Landfill for 20 years. WMNZ staff at the landfill manage the placement, disposal, refuse cover and capping off. They also manage the on-site Transfer Station plus the collection of fees and account holders. All on-site resources, staff, equipment and yellow gear is provided and operated by WMNZ, including the landfill compactor, front-end loader, dump truck, excavator, bulldozer, hook truck, roller and tractor.

J) Administration of the Contract

We have selected a highly experienced landfill team for your contract to ensure services are delivered effi liably. HCC will prima with Contractors Represen s7(2)(a) , Contract Manager s7(2)(a) , and Landfill Operations Manager s7(2)(a) nd the scenes, the contract will be expertly supported by Health and Safety Lead s7(2)(a) and the wealth of knowledge and industry leading experience from our OATS team s7(2)(a) and s7(2)(a)

K) Adequacy and Availability of Resources

WMNZ vehicles, equipment, yellow gear, staff and assets are detailed in the table below.

Council can be assured, with absolute peace of mind, that we have any eventuality covered. Our existing Lower North Island operations (Tirohia and Bonny Glen Landfills) provide access to back-up yellow gear, loaders, hook trucks and a wide range of other equipment. We also have at our disposal highly experienced staff, engineers, and trained operators for sick leave and annual leave cover.

WMNZ is also able to draw upon significant resources and experienced staff from:

- Our regional WMNZ office in Wellington, which will provide operational and management back-up and resources to this contract. This may include operators, hook

load drivers and back up in the booth.

- Our network of landfill operations throughout the Lower North Island provide critical mass which will ensure continuous operation support and expertise in relation to landfill operations and leachate management.
- The unprecedented landfill knowledge of our OATS team.

Numbers of Staff Proposed and Availability

The numbers of staff proposed, and availability demonstrates the level of commitment for contract staff that will contribute to the successful running of these services for HCC:

Staff Proposed and Availability			
Key Role	No	Location	Availability
Contractors Representative – s7(2)(a)	1	Wellington	As required
Contract Manager – s7(2)(a)	1	Wellington	As required
Landfill Manager – s7(2)(a)	1	Silverstream Landfill	100%
Landfill Team Leader – s7(2)(a)	1	Silverstream Landfill	100%
Landfill Specialist Input Methodology/ Decarbonisation – s7(2)(a)	1	Auckland	Estimate 20% or as required
Landfill Specialist Input Methodology – s7(2)(a)	1	Auckland	Estimate 10% or as required
Health, Safety, Quality & Environmental Lead – s7(2)(a)	1	Auckland	As required
Sustainability and Innovation Manager – s7(2)(a)	1	Auckland	As required
Transfer Station	4	Silverstream Landfill	100%
Kiosk Operator/Administrator	2	Silverstream Landfill	100%
Landfill Operators	7	Silverstream Landfill	100%
Litter Control/General Labour	3	Silverstream Landfill	100%

Plant and Equipment to be Used including Specialised Plant and Equipment

Current Operation

Plant and Equipment - Current Operation				
Equipment Type	No	Carbon Output	Type	Availability
Mule Truck	1	20.3 tCO2e	Diesel	100%
ADT	1	38.4 tCO2e	Diesel	100%
Hook Load Truck	1	19.8 tCO2e	Diesel	100%
Light Truck - Litter Control	1	0 tCO2e	Electric	100%
Loader	1	0 tCO2e	Electric	100%
Loader	1	68.1 tCO2e	Diesel	100%
Compactor	1	261.5 tCO2e	Diesel	100%
22 Tonne Excavator	1	32.5 tCO2e	Diesel	100%
40 Tonne Excavator	1	54.4 tCO2e	Diesel	100%
Bulldozer	1	20.2 tCO2e	Diesel	100%
Roller	1	0.6 tCO2e	Diesel	100%

Transition to Phase 3

Plant and Equipment - Transition to Phase 3				
Equipment Type	No	Carbon Output	Type	Availability
Mule Truck	2	166.6 tCO2e	Diesel	100%
ADT	1	61.9 tCO2e	Diesel	100%
Light Truck - Litter Control	1	0 tCO2e	Electric	100%
Loader	1	68.1 tCO2e	Diesel	100%
Compactor	1	261.5 tCO2e	Diesel	100%
22 Tonne Excavator	1	32.5 tCO2e	Diesel	100%
40 Tonne Excavator	1	54.4 tCO2e	Diesel	100%
Bulldozer	1	20.2 tCO2e	Diesel	100%
Roller	1	0.6 tCO2e	Diesel	100%

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Phase 3 Operation

Plant and Equipment - Phase 3 Operation				
Equipment Type	No	Carbon Output	Type	Availability
Mule Truck	2	26.1 tCO2e	Diesel	100%
Light Truck - Litter Control	1	0 tCO2e	Electric	100%
Loader	1	68.1 tCO2e	Diesel	100%
Compactor	1	261.5 tCO2e	Diesel	100%
22 Tonne Excavator	1	32.5 tCO2e	Diesel	100%
40 Tonne Excavator	1	54.4 tCO2e	Diesel	100%
Bulldozer	1	20.2 tCO2e	Diesel	100%
Roller	1	0.6 tCO2e	Diesel	100%

Phase 3 Operation - Hybrid Option

Plant and Equipment - Phase 3 Operation Hybrid Option				
Equipment Type	No	Carbon Output	Type	Availability
Mule Truck	2	26.1 tCO2e	Diesel	100%
Light Truck - Litter Control	1	0 tCO2e	Electric	100%
Loader	1	68.1 tCO2e	Diesel	100%
Compactor	1	261.5 tCO2e	Diesel	100%
22 Tonne Excavator	1	16.3 tCO2e	Hybrid	100%
40 Tonne Excavator	1	27.2 tCO2e	Hybrid	100%
Bulldozer	1	10.1 tCO2e	Hybrid	100%
Roller	1	0.6 tCO2e	Diesel	100%

Proposed Use of Local Subcontractors

WMNZ does not utilise subcontractors for the daily operation of Silverstream Landfill. Special Project Subcontractors are engaged by Tonkin & Taylor.

Location of Resources

All resources including staff and plant and equipment will be located on-site at the Silverstream Landfill. Should back-up resources be required, we will utilise our Wellington base.

Communication Systems

WMNZ will hold monthly operationa[redacted]ings facilitated by s7(2)(a) [redacted], Council's [redacted]nated Contract Manager and s7(2)(a) [redacted] Silverstream Landfill Operations Manager. These meetings will be a chance to review KPI statistics, discuss concerns and improvements, and ensure that the services are still meeting expected standards. More informal discussions will also be held as required to determine any issues and allow prompt resolutions.

WMNZ will hold monthly operational meetings facilitated by s7(2)(a) [redacted] Council's nominated Contract Manager and s7(2)(a) [redacted], Silverstream Landfill Operations Manager.

s7(2)(a) [redacted]ger Lower North Island and s7(2)(a) [redacted] will also be part of the Governance Group. This will be an opportunity to review KPIs in more detail, discuss possible innovations, and ensure that our service approach is still aligned to Council's expectations. We encourage the structure of the relationship to be modelled on the established framework that exists with our current HCC Kerbside Collection Services contract.

WMNZ will provide (as we do currently) regular compliance reports to Council, which will give assurance that KPIs are being met. We can also further customise the contract report on a recurring timeframe agreed with Council, detailing how we are tracking against set KPIs.

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HUTT CITY TE AWA KAIRANGI
Tō tātou tāone
Our city

Tender Forms and Appendices

SUPPORTING INFORMATION

Image: Tirohia Landfill and Energy Park, Waikato

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Our city

Appendix A

Attachment F - Health, Safety and Environmental Pre-Qualification Form

Attachment F – Health, Safety and Environmental Pre-Qualification Form

CONTRACTOR HEALTH, SAFETY AND ENVIRONMENTAL PRE-QUALIFICATION FORM

TENDER FOR:	**Silverstream Landfill Operations Contract**

In order that the Principal and the Contractor meet their mutual health and safety obligations under the Health and Safety at Work Act 2015 and all associated regulations, the Accident Compensation Act 2001 and the Resource Management Act 1991 please provide the following information:

SAFETY POLICY AND MANAGEMENT COMMITMENT	**Yes**	**No**
(a) Has the Contractor implemented a Safety Management System in accordance with ISO 45001 , OHSAS 18001 or similar approved Health and Safety Management System?	✓	
(b) Has the Contractor implemented an Environment Management System in accordance with ISO 14001, Envirostep or similar approved? (Current qualification to be forwarded for (a) – (b)).	✓	

Please see attached ISO Certificates.

SAFETY AND ENVIRONMENTAL TRAINING	**Yes**	**No**
(c) Will training specific to the Contract be given to the Contractor's employees?	✓	

Please see attached Training Policy Documentation

(d) Have the Contractor's employees been given all appropriate training regarding safety equipment and any other equipment intended for use on the Contract?	✓	
(e) Does the Contractor's First Aider and Safety Supervisor possess current qualifications?	✓	

For items d and e - this information is included in the Silverstream Landfill Health and Safety Management Plan attached.

SAFETY RECORDS	**Yes**	**No**
(f) Has there been any cautioning notices or prosecution by Worksafe, or local or regional environmental regulatory authority? If ticked "Yes" please provide details of the cautioning or prosecution on a separate sheet	✓	

Please see attached document for Notices.

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SAFETY POLICY AND MANAGEMENT COMMITMENT

SUBCONTRACTORS

		Yes	No
(g)	Are safety and environmental requirements specified for the Contractor's Subcontractors? If ticked "Yes" please specify.	✓	

Please see attached policy document.

		Yes	No
(h)	Does the Contractor have procedures for the control of the safety and environmental performance of Subcontractors?	✓	

Please see attached policy document.

On behalf of the Contractor, on signing this form, I confirm that:

Declaration	Yes	No
I am authorised to provide this information and sign this form.	✓	☐
The information provided in this form is true and correct.	✓	☐
I understand that if the information I have provided is not true and correct, the Principal may terminate any future Contract (if the Principal has reasonably relied on the accuracy of information provided in this questionnaire) at any time and with immediate effect by written notice.	✓	☐
I understand that the Contractor will be liable for anything the Principal has done or omitted because it has reasonably relied on the accuracy of information provided in this questionnaire.	✓	☐
I agree to abide by the requirements of the Health and Safety at Work Act 2015 and any amendments, Principal's induction, including those specifically outlined above.	✓	☐

Name of Tenderer:	Waste Management NZ Limited
Signed by authorised signatory of the Tenderer:	s7(2)(a) [redacted]
Name and title of authorised signatory:	s7(2)(a) [redacted] General Manager – Lower North Island
Date:	3 June 2022

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To provide timely and appropriate learning and development in order to promote a safe working environment.

CORPORATE REQUIREMENTS

1.1 A training records management system shall be established to record, manage and maintain corporate Health, Safety, Environmental, and Quality (HSEQ) training and competency based assessments related to that training for workers;

1.2 HSEQ inductions shall be established, documented and systematically provided to all workers and visitors at the commencement of their employment or visit. Where applicable client induction/training requirements must be followed;

1.3 Core Training (CT) will be identified in the corporate prescribed Training Needs Analysis (TNA) which is allocated to each Position Title (PT).

1.4 A licensing and competency record system shall be established and implemented for workers whereby roles requiring technical certifications, registration or licensing must be maintained;

1.5 HSEQ training programs shall be developed and delivered by workers with the appropriate qualification, levels of knowledge, skills and expertise in those areas of operation;

1.6 HSEQ training programs and packages shall be systematically reviewed for quality and currency of content, legislative and/or governance requirements;

1.7 A process shall be established to ensure Industry Training Organisation/s (ITO's) are engaged appropriately;

1.8 A monitor and review process shall be established to ensure company goals, objectives and targets are met.

BRANCH KEY REQUIREMENTS

1.1 A training plan shall be established to ensure employees receive relevant and timely training for the role and tasks they are expected to perform through a site TNA. A Branch based TNA must also address regulatory training requirements and client requirements where applicable that is not captured in the CT TNA;

1.2 Training programs and/or information shall be systematically reviewed and provided whenever a Branch and/or operation is impacted by change, including circumstances such as new equipment, processes and obligations;

1.3 Competency based training developed and delivered at the Branch level shall be reviewed in line with company requirements for Business Instructors (BI's);

1.4 A verification of competency process will be implemented for high risk tasks, plant and/or work environments and be maintained in the licensing and competency record system;

1.5 Where a license and/or mandatory training is a requirement for a task (including high risk work licences), only suitably trained and/or licensed employees will perform that task and will be maintained in the licensing and competency record system. Licences must be readily available;

1.6 Where appropriate an ITO will be engaged in accordance with company requirements;

1.7 A process to ensure worker training, licensing and competencies are kept current through established systems.

REFERENCE:

AS/NZS ISO 9001:2016 7.2, 7.3
ISO 45001:2018 7.2, A.7.2, 7.3, A.7.3, 7.5, A.7.5
AS/NZS ISO 14001:2016 7.2, 7.3
OHSAS 18001:2007 4.4.2

For further information refer to the Safety and Sustainability portal, Section 3 Support, Sub Section 3.4.0 Training and Competency

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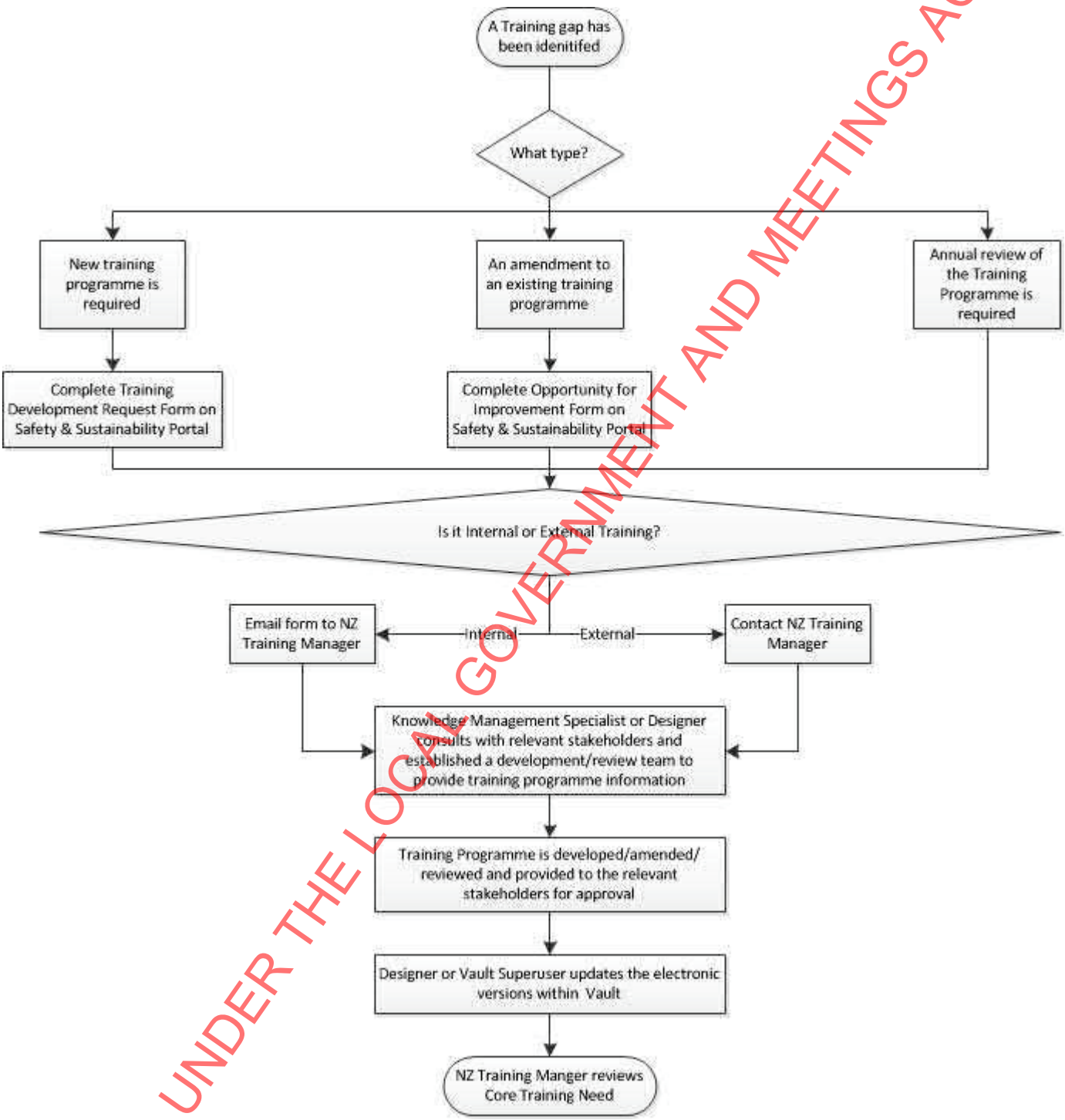
TRAINING DEVELOPMENT/AMENDMENT REQUEST FLOWCHART

HSEQ Management System



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New Zealand Training Plan

(September 2019)

Core & Elective Training Modules
Safety and Environment
Heavy Vehicle
Corporate Systems

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HOW TO USE THIS DOCUMENT

The WMNZ Training Plan is in line with the Vault Training Module Data Base.

The WMNZ Training Plan (WMNZTP) takes information from the Vault data base and provides a comprehensive list of all training available within Waste Management; Managers can view the list of courses, as well as a list of core training for each position. Managers can also view the list of training that is available externally and the delivery methods available for all training identified.

This document is regularly updated by WMNZ Training due to the on-going changes in business risk and compliance, the WMNZTP is therefore offered as a training overview of the services provided with further help or assistance for all your training needs being available from the WMNZ Training Manager or WMNZT team.

1. What is orporate prescribed 'Core Training'?

   Three core training courses (Company Induction, Site Induction and Risk Management Awareness) are prescribed by corporate and are required to be completed by all employees ***regardless of their position title and associated job description***. Core training is reviewed on a regular basis where new modules may be added or removed based on risk mitigation and/or changes within the services provided.

   Core training (C), is training that an employee must complete under current employment conditions. An employee who has not completed their core training has not fulfilled their engagement with the business. ***NOTE:*** ***Company and Site Induction modules must be covered again with workers if either of their content changes prior to any renewal dates for the workers.***

2. What is elective training?

   Elective training (E) is training that has been identified at a branch level for the individual employee and is based on compliance and risk management for the position over and above that identified as core training. As well as well as adding value to an employee's professional development. Elective training may not be a requirement of their employment such as is the case with core training.

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3. What training is recommended for employees in my branch?

   Considerations for an employee's site based Training Needs Analysis (TNA) in the various businesses, divisions and branches of WM, are identified and developed through analysis of the job description in relation to the specific position within the branch, suite of work instructions required to perform the work/tasks required (For example a technician in one position may require specialised Working @ Height or Confined Space for the role). This TNA plan should be viewed in conjunction with the full suite of training available at NZ Training (NZT) in each training stream listed below and based on the risks to the individual employee identified by the branch.

4. Where can i find the full suite of training available?

   The full suite of training available is held in this WM Training Planand on the Course Register tab of the Vault data base and covers all Safety, Health & Environment, Heavy Vehicle and company based policy and procedure, plus nationally recognised training modules.

5. Where Can I Find Any Training Amendments Or Reviews?

   The training amendments table in this plan is listed below and will give you up to date information on what courses are new, under development, inactive or superseded due to changes made to the individual courses.

6. Where Can I Find Training Schedules?

   The Vault data base carries these schedules in the training module, giving managers a snapshot of where the trainers will be visiting based on the training nominations and coordinated training sessions that have been generated for locations around the business.

7. External Training

   External Training is provided by an external provider to WM employees, WMT endeavors to internalise as much training as possible but some modules through set up costs, demand or logistics are deemed to be better delivered externally. External courses can be found in the Vault training course register tab or in the External Training table at the end of this plan.

   External Training providers will be selected against the following criterion:

   - experience and knowledge of the wider waste industry
   - ability to deliver training to New Zealand Qualification Authority (NZQA) framework and standards
   - national coverage in regards to training

8. Courses marked with an asterisks (*) are currently under review.

NEW ZEALAND TRAINING PLAN
HSEQ Management System

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A GUIDE TO COURSE TYPE/APPLICATION

Abbrev.	Types of Training	Notes / Description
TBT	Toolbox Talks	10 - 20 minute toolbox talks for updates and refreshers
CPP	Company Policy and Procedure	30 - 60 minute sessions on a company policy and procedures such as evacuations or site inductions
SCS	Skills Coaching and Supervision	One-on-one training in specific equipment or tasks such as work instructions or vehicle familiarity (BI or mentor delivered)
CBT	Company Based Training	Theory based such as Risk Assessments of Work Instructions (24 month expiry), workshops or assessment based skills training with specific learning outcomes that are applicable to the business (driver training for the eg)
IAL	Industry Accreditations and Licenses	Includes Inductions, tickets, accreditations and statutory licenses
NRT	Nationally Recognised Training	Formally recognised / accredited Statements of Attainment or Qualification
EXT	External Training	Courses delivered by an external training provider.

A Guide to Delivery Format	
NZT	New Zealand Training - Trainer / Assessor
EL	eLearning
BI	Business Instructor (nominated by manager)
HSE	Health & Safety Advisor

Training Contacts

Training Manager
s7(2)(a) [redacted]@wastemanagement.co.nz
Mobile: s7(2)(a)

HSE Systems Co-coordinator
s7(2)(a) [redacted]@wastemanagement.co.nz
Phone: s7(2)(a)

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CORE TNA TRAINING COURSE INFORMATION

Type	Course Name	Duration	Refresher	Who	Delivery Method
CPP	Company Induction	2 hr	Nil*	All employees	eLearning
CPP	Site Induction	2 hr	12 mth	All employees	Business Unit
BT	Risk Management Awareness	2 hr	24 mth	All employees	NZT / HSE
CBT	Injury Management (ACC PP Gallagher Bassett)	1 hr	12 mth	All Employees	HSE

*Core training modules are to be completed by all employees **within 3 months of employment** and Core Compliance Training is also to be refreshed at nominated intervals.*

**Company Induction for Employees only needs to be re-done if the content of the induction pack changes, or if the worker leaves Waste Management and then is re-employed. Company Inductions for Contractors expire every 2 years.*

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SAFETY & ENVIRONMENT MODULES (ELECTIVE)

These courses are selected by the branch based on the added risk or development requirements of the employee's position. The course information tabled below is taken from the Vault data base at the time of reviewing this plan and may have changed, for an accurate list of all courses available refer to the Vault training register.

Type	Course Name	Duration	Refresher	Who	Delivery Method
NRT	Apply First Aid (various levels)	8 hr	24 mth	St Johns	EXT
NRT	Approved Filler (HSNO Act)	6 hr	60 mth	Discretionary	EXT
EXT	Articulated Dump Truck (Hauler operations)	8hr	NA	Discretionary	EXT
CBT	Asbestos Awareness	1 hr	24 mth	Driver / RTS	NZT / HSE / BI
CPP	Business Rules & Delegated Levels of Authority	1 hr	12 mth	Managers	CFO
CBT	Business Instructor Support Workshops	8 hr	NA	BI's	NZT
EXT	Certificate 1V IN Adult Education	TBA	NA	Trainer / Assessors	ITO / PTE
EXT	Certificate 1V in Front Line Management	TBA	NA	Managers / Supervisors	ITO / PTE
EXT	Certificate 1V in Occupational Health & Safety	TBA	NA	H&S Reps / Advisors	ITO / PTE
EXT	Chemical Management, Hazardous Goods & MSDS	8 hr	24 mth	Technical / RTS / Supervisors	EXT
EXT	Confined Space Entry	16 hr	24 mth	Job description sensitive	EXT
EL	Competition & Consumer Law Awareness	1 hr	12 mth	By Position	EMA Learning
CBT	Client Risk Assessment Management Plan (CRAMP)	2 hr	24 mth	Sales persons / managers	NZT / HSE
CBT	Coordinated Incident Management System (CIMS)	4 hr	24 mth	Managers / Supervisors	NZT / HSE
NRT	Dangerous Goods	8 hr	60 mth	Selected drivers / others	NZT

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Type	Course Name	Duration	Refresher	Who	Delivery Method
CBT	Emergency Warden Training	3 hr	24 mth	Managers discretion	HSE
CBT	Environmental Impacts	1 hr	24 mth	Managers / supervisors	HSE / BI
CBT	Event Report Pad	1 hr	24 mth	Managers discretion	NZT / HSE / BI
NRT	F Endorsement	10 hr	NA	Fork lift operators	NZT
CBT	Fatigue Management	1 hr	24 mth	Drivers in general	NZT / HSE
NRT	Fire Fighting Equipment	4 hr	24 mth	Managers discretion	EXT
CBT	Global Positioning Satellite (GPS) Training	1 hr	12 mth	Surveyors / Managers	BI
EXT	H&S Representative Levels 1, 2 and 3	16 hr	NA	H&S committee / champions	EXT
EXT	Handling & Transportation of Infectious Substances	2 hr	24mth	Drivers carrying 6.2	EXT
CBT	Incident/Accident Investigation – Introduction for Managers	4 h	NA	Supervisors/Managers	NZT
EXT	Incident Causation Analysis Method (ICAM)	16 hr	NA	Managers / investigators	EXT
CBT	Injury Management (ACC PP Gallagher Bassett)	1 hr	12 mth	All employees	NZT / HSE / BI
CBT	Introduction to Vacuum and Pumping Loading	4 hr	24 mth	Vacuum truck drivers	BI
EXT	Introduction To Process Safety	2 hr	NA	Managers / Supervisors	EXT
CBT	Isolation Of Energy Sources	2 hr	24 mth	NZT / HSE	NZT / HSE
EXT	ISO Internal Auditing	16 hr	NA	HSE Advisors	EXT
CBT	Job Safety & Environmental Analysis (JSEA)	1 hr	24 mth	Operational staff	NZT / HSE / BI

NEW ZEALAND TRAINING PLAN
HSEQ Management System

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Type	Course Name	Duration	Refresher	Who	Delivery Method
CBT	Landfill Operations	16 hr	NA	Landfill Operational employees	BI
EXT	MAF Accreditation	4 hr	36 mth	Custom bonded areas	EXT
CBT	Manual Handling / Slip / Tip / Fall	2 hr	24 mth	Manager discretion	NZT / HSE
EXT	National Certificate In Transportation & Waste Recovery	TBA	NA	Manager discretion	MITO
CPP	Performance Management	2 hr	24 mth	Manager	Human Resources
NRT	Permit to Work Receive & Issuer	8 hr	24 mth	Persons who plan or authorise work	EXT
CBT	Reversing Awareness	1 hr	24 mth	Drivers	NZT / HSE
CBT	Risk Management	4 hr	24 mth	Manager discretion	NZT
CBT	Safe Working Near Electrical Power Lines *	2 hr	24 mth	Drivers of high lift vehicles	NZT / HSE
EXT	Safety Leadership Managers / Supervisors	8 hr	NA	Manager discretion	EXT
NRT	Site Safe Building & Construction Version 9	4 hr	24 mth	Manager discretion	NZT
NRT	Site Traffic Management Supervisor Levels 1, 2 & 3	16 hr	36 mth	Manager discretion	HSE / EXT
CBT	Spill Response	1 hr	24 mth	Heavy vehicle drivers	NZT / HSE / BI
NRT	Traffic Controller Basic Level 1 (TC)	8 hr	36 mth	Manager discretion	HSE / EXT
NRT	Kerbside Collection Team Leader (KCTL)	4 hr	36 mth	Manager discretion	HSE / NZT
NRT	Working @ Height	8-16 hr	24 mth	Manager discretion	EXT

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HEAVY / LIGHT VEHICLE / PLANT & EQUIPMENT MODULES (ELECTIVE)

Type	Course Name	Duration	Refresher	Who	Delivery Method
CBT	Bulldozer Assessment	Open	NA	Plant Operators	NZT/BI
EXT	Class 1 License	Open	NA	Managers discretion	NZTA
NRT	Class 2 License	6 hr	NA	Managers Discretion	NZT
NRT	Class 3 License	6 hr	NA	Managers Discretion	NZT
NRT	Class 4 License	6 hr	NA	Managers Discretion	NZT
NRT	Class 5 License	6 hr	NA	Managers Discretion	NZT
CBT	Compactor Assessment	Open	NA	Plant Operators	NZT/BI
NRT	Fatigue, Work Time & Log Book Rule	8 hr	NA	Driver of heavy vehicles	NZT
CBT	Heavy Vehicle Ridged	Open	12 mth	Selected Drivers	NZT
CBT	Heavy Vehicle Ridged Combination	Open	12 mth	Selected Drivers	NZT
NRT	Truck Mounted Crane Truck Qualification	Open	12 mth	Selected Drivers	NZT
SCS	Hilux Off-Road Training – Level 1	8 hr	NA	Selected Drivers	EXT
CBT	Light Vehicle Assessment (Car or Uttility)	Open	NA	Drivers of WM LV's	NZT
CBT	New Fleet Familiarisation	Open	NA	New / existing Drivers	NZT / BI
NRT	OSH Forklift Certificate	8 hr	36 mth	Fork lift operators	NZT
CBT	Roller Assessment	Open	NA	Plant Operators	NZT/BI
NRT	Rollers Endorsement	Open	NA	Selected operators	NZT

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Type	Course Name	Duration	Refresher	Who	Delivery Method
NRT	Safe & Fuel Efficient Driving (SAFED)	8 hr	NA	Heavy vehicle drivers	NZT
CBT	Septic & Portalet Truck Operations	Open	None	Portaloo drivers	BI
CBT	Shuttle Truck Operations	Open	None	Selected Drivers	BI
CBT	Side-load Truck Operations	Open	None	Selected Drivers	BI
CBT	Smart Skip Truck Operations	Open	None	Selected Drivers	BI
CBT	Suction Truck Operations	Open	None	Selected Drivers	BI
CBT	TIL Servicing Truck Operations	Open	None	Selected Drivers	BI
CBT	Tip Truck Operations	Open	None	Selected Drivers	BI
NRT	Tracks Endorsement	8 hr	NA	Selected Drivers	NZT
CBT	Truck Stability	1 hr	12 mth	Selected Drivers	NZT
CBT	Utility Truck Driver Assessment	Open	12 mth	Selected Drivers	NZT
NRT	Wheels Endorsement	8 hr	NA	Selected Drivers	NZT
CBT	Bin Delivery Operations	Open	NA	Selected Drivers	NZT / BI
CBT	Front Load Truck Operations	Open	None	Selected Drivers	BI
CBT	Skip Operations	Open	None	Selected Drivers	BI
CBT	Glass Paper Sorting Truck Operations	Open	None	Selected Drivers	BI
CBT	Truck Mounted Crane Operations	Open	None	Selected Drivers	BI
CBT	Hook Operations	Open	None	Selected Drivers	BI

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Type	Course Name	Duration	Refresher	Who	Delivery Method
CBT	Kerb-Side Operations	Open	None	Selected Drivers	BI
CBT	LEV Operations	Open	None	Selected Drivers	BI
CBT	Side Load Operations	Open	None	Selected Drivers	BI
CBT	Rear Load Operations	Open	None	Selected Drivers	BI
CBT	Suction and Liquid Operations	Open	None	Selected Drivers	BI

EXTERNAL TRAINING COURSES / DETAILS

Type	Course Name	Duration	Refresher	Cost per person based on No. of attendees required
EXT	ICAM Lead Investigator course	2 day		*Minimum number required to run an in-house course – Client courses available on request*
EXT	ICAM Basic Investigator course	1 day		*Minimum number required to run an in-house course – Client courses available on request*
EXT	ICAM Refresher course	1 day		*Minimum number required to run an in-house course – Client courses available on request*
EXT	Hazardous Substances & New Organisms	8 hr	36 mth	No preferred supplier identified
EXT	All Adult Education Courses (7108 / 4098 / 11552 etc)	2 x days / std	None	Contact NZ Training Manager on: §7(2)(a)@wastemanagement.co.nz

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TRAINING AMENDMENTS

Superseded Courses

Type	Course Name	New Course Name	Delivery
CBT	All heavy vehicle operational based assessments previously carried out by NZT are now replaced by the Business Instructor forms for those services and can be found on the portal. These forms are competency based assessing the useage of equipment attached to a Waste Management service vehicle	Various – refor to BI Forms on the WM Portal	BI

New Content Release

Type	Course Name	Duration.	Refresher	Delivery	Pre- requisites	Date of Release
CBT	Heavy Ridged & Heavy Ridged Combination	Complete	12 mths	NZT	Class 2/4 & 5	2018

Under Development

Type	Course Name	Duration.	Refresher	Delivery	Pre- requisites	Approx. Timeframe to Release
CBT	Various Business Instructor forms (Now available)	Complete	12 mths	BI	Correct license	2018 on

Inactive Courses

No.	Type	Course Name	Duration.	Refresher	Stream
For a full list of inactive Vault courses please contact the NZ Training department or s7(2)(a)					

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WM LOADER OPERATIONS – ASSESSMENT

Driver Name:		NZDL #	Version #
Vehicle Make:	Model:	Fleet # / Rego:	Operating weight
Assessment Date Start:	Assessment Date Finish:(If applicable)	Coach / Trainer Name:	Assessor Name:
/ /	/ /		

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Briefing

Explain the assessment process to the trainee, including timing and equipment being used. You should also explain that this includes practical and verbal response type answers which cover off everything that should have been coached / trained when under supervision.

1. Compliance & Admin
2. VCR check / Functional
3. Vehicle Knowledge
4. Site Specific / TMP
5. Operational / SOP
6. Terrain
7. Discharge Point
8. Shut Down
9. Operator Assessment

Assessing

Conduct the assessment through observation and demonstrations from the trainee. Ask questions to gain understanding of knowledge with regards to the SOP. It is not acceptable to simply tell the candidate how to achieve an objective or task, the trainee must be given opportunity to demonstrate skill & knowledge, explain the process and offer information about the practise point before assessing competency.
The individual tasks will need to be performed consistently and to the standard for competency to be awarded.

Assessment Program

Individuals cannot be assessed as having overall competency by the assessor until all tasks covered in the coaching form have been observed and recorded as competent. No trainee will be given the opportunity to be assessed unless all tasks & objectives have been deemed competent by the coach / trainer and signed off by all relevant parties.

Completing Documentation & Signatures

The BUI assessing the trainee must:

- Record comments for any task deemed NYC
- Record comments on overall performance for each completed task
- The ***LINE MANAGER*** is required to ***REVIEW & SIGN OFF*** on completed assessment paperwork.
- It is the responsibility of the ***LINE MANAGER*** to ensure all paperwork is loaded correctly into vault (both coaching & assessment documents) and original documents filed in trainee file.

NOTE:

When completing this assessment form, coaching / training plays no part in it. If the assessor is required to intervene in any part of the tasks listed below then that is an automatic NYC. Completing the remaining tasks is permissible but the trainee will still be deemed ***"still under supervision"*** until such time as retraining in the task deemed NYC is completed and the trainee can successfully demonstrate the appropriate skill for that task

Feedback

If you have any comments / suggestions or contributions to these documents, please complete a HSEQ System Improvement form 3.1.1.01.06 and return it to the HSEQ Systems Coordinator – s7(2)(a) [redacted]

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Task 1 - Compliance and Admin				
N/A	✗	✓	Objective	Comments
			Issuing of relevant tools and documentation ➢ Event Pad ➢ Emergency procedures handbook ❖ Contact details completed ➢ Other	
			Can produce NZDL ➢ Has correct licence & endorsement for vehicle driven	
			Inductions ➢ WM site induction/s completed ➢ Into all customer sites as required ❖ Local ports, landfills, transfer stations, MRF	
			PPE ➢ Uses PPE correctly & at correct times	
			Use of VCR ➢ Completes VCR both pre & post ➢ Understands process and steps with completed VCR sheets	VCR sheet no.: ……
			Emergency procedures & equipment ➢ Spill kit ➢ First Aid ➢ Fire Extinguishers ➢ Faulty equipment ➢ Prohibited substances ➢ Assembly points ➢ Fire wardens ➢ Emergency wardens } Shown / trained / signed off	All signed off and filed accordingly, completed during coaching & training phase
			Vehicle specific SOP / RA / WI ➢ Operator has completed all relevant paperwork associated to specific vehicle ➢ Aware of relevant hazards and risks associated with this task and item of plant	All signed off and filed accordingly, completed during coaching & training phase

				➢ Completed RA & WI for task and item of plant	

Task 2 – VCR Check / Functional	
Objective	Comments

				Walk around check ➢ Level of vehicle ❖ Busted suspensions ❖ Flat tyres ➢ Obvious leaks ❖ Oil ❖ Water ❖ Hydraulic	
				Cab set up ➢ ROPS / FOPS ➢ Seat ➢ Mirrors ➢ Visibility ➢ Controls ➢ Grooming ❖ Cleaning ❖ Loose items	
				VCR check (use of mobile plant VCR sheet) But not limited to: ➢ Coolant system ➢ Air filters ➢ Fluid levels ❖ Engine ❖ Water ❖ Hydraulic ❖ Transmission ❖ Brake ❖ Fuel ➢ Windows & mirrors ➢ Hoses ➢ Fire Extinguisher ➢ First Aid kit ➢ Spill kit ➢ Camera ➢ Communications	

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				❖ RT Radio ❖ Cell phone ❖ Other ➢ Lights ❖ Head lights ❖ Tails lights ❖ Brake ❖ Indicators ❖ Beacons ❖ Working lights	
				Attachments ➢ Security / conditions ❖ Pins & bushes ❖ Locking pins ❖ Teeth ❖ Cutting edges ❖ Hydraulic quick hitches ❖ Rams ❖ Ram cylinders ❖ Auxiliary hosing ❖ Cracks ❖ Tips ❖ Linkages	
				Start up ➢ Master switch ➢ Machinery self-check system ➢ Air pressures ➢ Engine pressures ➢ Gauges ➢ Emergency kill switch (Weekly)	
				Functional checks ➢ Steering ➢ Hydraulics ➢ Gears ➢ Braking ❖ Service ❖ Hand ➢ Lights ➢ Gauges ➢ Seat belt ➢ Warning devices ➢ Emergency kill switch ➢ Other	

				Entry & Exit ➢ 3 pts of contact always ➢ Wears a seatbelt while driving ➢ Neutral gear is selected, and the handbrake applied	
				Other	

Task 3 – Vehicle Knowledge				
N/A	×	✓	Objective	Comments
			Greasing and Lubrication ➢ Grease points and greasing requirements ➢ Self-lubrication system	
			Vehicle specific ➢ Pinch Points ➢ Crush Points ➢ Blind Spots ➢ Weight ➢ Height ➢ Width ❖ Operating position ➢ Fire Suppression system ➢ Proxy points	
			Towing / Recovery ➢ Attachment point/s ➢ Equipment ❖ Strops ❖ Chains ❖ Ropes	
			Other	

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Task 4 – Site Specific / TMP				
N/A	×	✓	Objective	Comments
			WM 5 METRE RULE ➢ Company policy of being within those limits	
			Restrictions on site ➢ Height ➢ Surface ➢ Direction of travel ➢ Vehicle hierarchy ➢ Actions if pedestrians enter prohibited areas around the operation	
			Vehicle movements ➢ WM TMP policy within the site ❖ Company vehicles ❖ Contractor vehicles ❖ Right of way on tip face ❖ On tip face (public and commercial) ❖ Near the pit ❖ In transfer stations ❖ In recycling area ❖ Other	
			Parking ➢ Designated area ➢ Site specific ➢ Attachments lowered ➢ Park brake ➢ Lever locked engaged	
			Actions to be taken for the below site-based procedures ➢ Emergency evacuation procedures for the site	
			Other	

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Task 5 – Operational / SOP				
N/A	×	✓	Objective	Comments
			WM 5 METRE RULE ➢ Company policy of being within those limits	
			Scanning ➢ Scanning from a central position ➢ Mirror set up ➢ Use of auxiliary visual aids ➢ Surface hazards ➢ Waste hazards ➢ Stability	
			Entry & Exit ➢ 3 pts of contact always ➢ Wears a seatbelt while operating ➢ Neutral gear is selected, and the handbrake applied	
			Working near power line ➢ Always treating lines as live ➢ 4 metre clearance	
			Loading ➢ Understands communications with loader ➢ Ground conditions ➢ Parks is designated parking area ➢ Engages brake ➢ Stays in machine *Unloading* ➢ Checks ground conditions ➢ Use spotters ➢ Keep vehicle align ➢ Demonstrate engaging & disengaging PTO ❖ Selects neutral ❖ Engages handbrake ❖ Depressing of clutch ➢ No more than 1500RPM ➢ Can operate efficiently below the 1500RPM level ➢ Release rev at start of final stage	

			➢ Can explain the damage caused by over revving	
			Uncontrolled energy ➢ Crushing hazard ➢ Doors ➢ Pinch points	
			Vehicle speed ➢ Selects & uses correct gear ➢ Correct for situation ❖ Weather ❖ Surface ❖ Traffic Volume	
			Conditions ➢ Slippery ➢ Wet ➢ Icy ➢ Fog ➢ Misty ➢ Rain	
			Other	

Task 6 – Terrain				
N/A	×	✓	Objective	Comments
			Ascending & Descending ➢ Gear selection ➢ **WM 5M RULE** applies where practical ➢ Traction control ➢ Speed control	
			Gradients ➢ Batters ➢ Slopes ➢ Profile set ups ➢ Travel direction	

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			➢ WM gradient policy 4:1	
			Other	

Task 7 – Discharge Point (Tip Face)				
N/A	×	✓	Objective	Comments
			WM 5 METRE RULE ➢ Company policy of being within those limits	
			Tipping operations ➢ TMP in place ➢ Controls tipping movements ➢ Checks for overhead & other hazards ➢ Covers completed tip face minimising exposed face ➢ Conducted in accordance with site rules ➢ Monitors tip face stability / condition ➢ Material movements in accordance with environmental protection rules ➢ Procedures for operating near tip edges ➢ Pushing in to load safely ➢ Continually checks blind spots while operating ➢ Travels safely – speed and direction, bucket low to ground.	
			Other	

Task 7 – Shut Down				
N/A	×	✓	Objective	Comments
			Parking ➢ Designated parking area ➢ Re-fuelling ➢ Shut down ❖ Handbrake / Neutral ❖ Specific vehicle procedure followed	

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			➢ Reverse parking only ➢ All attachments lowered to the ground ➢ Control locks set ➢ Stored energy ❖ Hydraulics release ➢ Post VCR check	
			Vehicle grooming ➢ Use of water blasters ➢ Removal of operator excess	
			Other	

Task 8 – Operator Assessment				
N / A	×	✓	Objective	Comments
			As per corporate driver training in cab assessment tool	Only conducted by company corporate driver trainers, must be completed within 90 days of candidate start date.

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Declaration

Assessor Declaration:

I the assessor verifies that the tasks as entered in this document are accurate and in accordance with procedures or instructions as described in the coaching form for this vehicle.
I believe at time of assessment the candidate has successfully demonstrated the necessary skills that meet the standards set by WM and therefore has been assessed as competent.

Assessor Name: Date: …….. / …….. / ……..

Signed:

Comments:

Candidate Declaration:

I accept that the assessment conducted was fair and reasonable and accept the feedback on my performance.

Candidate Name: Date: …….. / …….. / ……..

Signed:

Comments:

Line Manager:

At the time of assessment, I agree to all comments made by the assessor, and accept that if further training is required due to incomplete tasks, that I will reschedule at the earliest possible time, once the candidate has been given adequate re training to achieve those given tasks.

Line Manager Name: Date: …….. / …….. / ……..

Signed:

Comments:

Waste Management

HSEQ Management System

SAFETY MANAGEMENT PLAN

SILVERSTREAM LANDFILL

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2 CONTACTS

Physical address:	Reynolds Bach Drive Stokes Valley Lower Hutt
Postal address:	PO Box 38383 Wellington Mail Centre
Telephone:	04 563 6952
LNI General Manager:	s7(2)(a) @wastemangement.co.nz & s7(2)(a)
Landfill Manager:	s7(2)(a) @wastemanagement.co.nz & s7(2)(a)
Landfill Supervisor:	s7(2)(a) – s7(2)(a)
Regional HSE Advisor:	s7(2)(a)

3 LANDFILL OPERATING HOURS

Monday – Friday	7:30 am – 5:00pm
Saturday	8:00am – 5:00pm
Saturday (Daylight Saving Time)	8:00am – 6:00pm
Sunday & Public holidays	9:00am – 5:00pm
Sunday & Public holidays (Daylight Saving Time)	8:00am – 6:00pm
Good Friday	Closed
Christmas Day	Closed
New Year's Day	Closed

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4 REVISION STATUS

Date	Issue	By	Checked	Approved
24/11/2015	1	s7(2)(a) [redacted]		
13/06/2017	2			
20/01/2018	3			
22/2/2019	4			
22/2/2021	5			

5 CIRCULATION

This Safety Management Plan is strictly controlled and maintained. It may only be circulated to those shown below as registered holders. Each registered holder is responsible for the safe keeping of the Safety Management Plan and for maintaining the plan in accordance with the update instructions issued from time to time. All changes must be authorised by the LNI General Manager and Landfill Manager.

Copy	Registered holder	Position title
1	File	
2	s7(2)(a) [redacted]	General Manager, Lower North Island
3		Landfill Manager, Silverstream Landfill
4		Regional HSE Advisor, Wellington
5		Solid Waste Manager, Hutt City Council
6		Senior Civil Engineer, Tonkin & Taylor Engineers
7		Contracts Manager, Leach & Co
8		General Manager, EarthLink Inc
9		Area Manager, LMS

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6 INTRODUCTION

6.1 About Waste Management New Zealand Limited

Waste Management New Zealand Limited (WMNZ) is New Zealand's leading resource recovery, recycling and waste management provider. We are a modern, progressive and professional operator and we are driven by the core values of safety, sustainability and customer service.

We understand that our most valuable asset is our people and we are committed to their safety and wellbeing. In addition, we are focused on providing our customers with a responsive service offering whilst incorporating a corporate sensitivity towards the environment.

Our capabilities include recycling and resource recovery, waste to energy initiatives, solid waste management, liquid and hazardous waste collection, treatment and disposal and the design and operation of many state-of-the-art waste management and recycling facilities nationwide.

Our facilities include leading edge landfill and resource recovery parks, material recovery facilities, transfer stations and liquid, hazardous and medical waste processing facilities. Each facility features best practice environmental protection measures.

6.2 About Silverstream Landfill

Silverstream Landfill is owned by Hutt City Council, however the day to day operations are contracted to WMNZ.

The landfill was opened for operation in 1972 and has gone through a number of significant design changes from the initial landfill which was unlined although leachate drainage was installed to the current Stage 2 which is designed to meet Class A landfill requirements.

Silverstream Landfill is a putrescible refuse disposal site for the Hutt Valley and Upper Hutt region; it is available to domestic type customers, visiting with cars, utility vehicles, trailers and vans plus commercial type customer(s) larger trucks etc. This makes the site on occasion very busy and so care is required when driving about.

A number of key organisations are involved to effectively manage Silverstream Landfill, they are:

- Hutt City Council (Owners)
- Waste Management New Zealand (Daily Operations)
- Tonkin and Taylor (Engineers & Monitors)
- LMS (Methane recovery & power generation)
- EarthLink (Ops Shop Recovery)
- Contractors (Capital Works)

Each of the organisations above are PCBUs (Person Undertaking Business or Undertaking) and have responsibilities and duties to ensure that people and the environment at Silverstream Landfill are kept as best as possible from any harm.

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7 PURPOSE

The purpose of the Safety Management Plan (SMP) is to establish and maintain an effective health and safety management system. WMNZ is committed to implement a structured approach to workplace health and safety in order to achieve a consistently high standard of safety performance.

This Plan will assist WMNZ in meeting its obligations in accordance with the health and safety legislation.

This Plan applies to all WMNZ officers, workers and to other persons at risk from work carried out at Silverstream Landfill. Failure to comply with the requirements of this Plan may lead to disciplinary action or being prohibited from accessing and/or working on the site.

8 HEALTH & SAFETY POLICY

8.1 Objectives

At WMNZ and its subsidiaries, we are committed to the safety, health and wellbeing of our employees. We believe that all workplace incidents, injuries and illnesses are preventable and aspire to achieve our aim of 'ZERO HARM' by making health and safety the first priority in all our business activities.

We also believe that attaining the highest standards in health and safety is paramount to the success and sustainability of our business.

8.2 Waste Management achieves these objectives by:

- Expecting all workers and contractors to cease work where there is a threat to safety;
- Consulting with workers and relevant stakeholders in the decision making processes impacting on workplace health and safety;
- Complying with all legal requirements, codes of practice and standards applicable to our activities;
- Ensuring our systems and processes effectively support the business and our workers to work safely
- Demonstrating visible safety leadership through our supervisors, managers and Directors;
- Identifying and understanding the hazards relevant to the activities we undertake and provide effective controls to assess and manage them appropriately;
- Providing appropriate training and support to our workers and contractors to enable them to understand our vision of 'ZERO HARM', and to allow them to perform their roles competently and safely;
- Setting objectives, targets and key performance indicators which continually drive us to improve our health and safety performance;
- Learning from our performance and continuously improving our processes and work practices, and sharing lessons learnt with others;
- Ensuring that all incidents are investigated fully - specifically identifying the causal and contributing factors so that appropriate corrective actions are taken;
- Regularly undertaking audits and inspections of our operations;
- Communicating this Policy to employees and interested stakeholders; and reporting on our health and safety performance openly and transparently.

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8.3 All officers are required to

- know about workplace health and safety matters and keep up to date
- gain an understanding of the operations of the organization and the hazards and risks generally associated with those operations
- ensure the PCBU has appropriate resources and processes to eliminate or minimize those risks
- ensure the PCBU has appropriate processes for receiving information about incidents, hazards and risks, and for responding to that information
- ensure there are processes for complying with any duty, and that these are implemented
- verify that these resources and processes are in place and being used

8.4 All workers and contractors are required to:

- Carry out their work in accordance with WMNZ's safety policies, processes and procedures;
- Be accountable for their own safety, and that of others; 'SLAM' – **Stop, Look, Assess and Manage** the hazards and risks inherent to the activities they undertake;
- Stop work where there is a threat to their or others' safety;
- Report any hazards or identified risks and all incidents which cause actual or potential injury or damage.
- Take reasonable care that his or her acts or omissions do not adversely affect the health and safety of other persons
- Comply, so far as reasonably able, with any reasonable instruction that is given to them by the PCBU to allow the PCBU to comply with the law

8.5 Worker Health and Wellbeing

- Employed workers are required to undergo an annual health assessment at WM's cost which may include health monitoring in relation to identified work risks and a general health assessment for the employee's benefit
- The employed worker will receive all health assessment results, WM will not receive any personal information relating to individual health assessments results with the exception of health monitoring of work related hazards.
- Non-permanent workers will be assessed dependently on the task they are completing for WM. Where the task has a potential risk to a workers health and wellbeing this will be discussed and reviewed accordingly.

8.6 Application

The health and safety policy applies to all employees, contractors and joint ventures engaged in activities under WMNZ's operational control.

Full suite of WMNZ Policies is available in Appendix A.

9 INTERPRETATIONS

Terminology	Interpretations
Person Conducting a Business or Undertaking (PCBU)	Refer to Appendix B
Officer	Refer to Appendix B

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Worker	Refer to Appendix B
Workplace	Refer to Appendix B
Reasonably practicable	Refer to Appendix B
Notifiable injury or illness	Refer to Appendix B
Notifiable incident	Refer to Appendix B
Notifiable event	Refer to Appendix B

10 RESPONSIBILITIES

10.1 WMNZ Company Officer

It is the responsibility of the Company Officer to:

- Acquire and keep up to date knowledge of work health and safety matters;
- Gain an understanding of the nature of the operations including the hazards and risks associated with those operations;
- Ensure that the person conducting a business or undertaking (PCBU) has the appropriate resources and processes to enable hazards associated with the operations to be identified and risks eliminated or minimised;
- Ensure that the PCBU has appropriate processes for receiving and considering information regarding incidents, hazards and risks and responding to these in a timely manner;
- Ensure that the PCBU implements the necessary processes for complying with the companies duties and obligations under the contract;
- Verify all of the above.

10.2 Landfill Manager

It is the responsibility of the Landfill Manager to:

- Understand, promote and comply with all Company health and safety policies, and procedures and work instructions;
- Engage with workers in an open honest and meaningful way to ensure they understand what safety standards are expected of them;
- Encourage feedback and communication channels between workers and senior leaders;
- Ensure that the HSE Manager, Advisors and senior leaders are made aware of issues or concerns on health and safety, especially workers identify hazards or limitations in any operational procedures;
- Demonstrate commitment to health and safety and model safe work practices to workers;
- Put into practice what WMNZ expect workers to follow;
- Ensure that safety is included in all meeting agendas as a set agenda item;
- Be accountable for involving and assisting workers in any change management processes;
- Ensure that health and safety is integrated into team planning and does not get downgraded based on competing priorities, budgetary constraints, or a lack of resources;
- Promote and encourage open discussions on health and safety at all levels of the business to ensure that workers can achieve outcomes based on open communication, consultation, negotiation and agreement;
- Establish and promote fair and equitable issue resolution processes;

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- Initiate HSE activity within their area of control, including toolbox talks, risk assessments, inspections and Key Risk Observations;
- Promote the reporting of hazards, and actively engage in day-to-day safety discussion with workers under their control (Safety Interactions);
- Support and monitor the timely close-out of corrective actions within their area of control.

10.3 HSE Advisors

It is the responsibility of the HSE Advisor to:

- Provide technical advice and support to Business Unit Managers in the establishment of HSE objectives, targets and strategies;
- Provide technical advice and support to Managers/Supervisors and workers in the identification, assessment and control of workplace risks, including purchasing decisions and plant modifications;
- Provide a central point of contact for HSE Legislation, standards and statutory requirements applicable to their region;
- Monitor and communicate legislative changes and best practice initiatives to management and workers;
- Advise on regional compliance with HSE Legislation;
- Assist in the development of internal and external HSE audit action plans to address identified deficiencies;
- Assist in the identification, development and implementation of safety related training programs for workers and management;
- Monitor, facilitate and lead when required in incident reporting and investigation processes, including the conduct of investigations for serious incidents;
- Assist workers with individual health concerns/issues;
- Work with safety, environment and quality committees;
- Support HSR's and employee representatives;
- Assist in reviewing and updating Company policies, procedures and work instructions.

10.4 Workers

It is the responsibility of all workers to:

- Take ownership of their own health and safety for those matters within their control or ability to influence;
- Work with colleagues to promote health and safety, environment and quality and ensure that it becomes a part of everyday business;
- Contribute to providing quality information that enables the establishment of baseline compliance levels and the measurement of changes in compliance over time. This information provides a reference point for targeting prevention and better practice initiatives;
- Be accountable as an individual to enhance and promote a 'safety-first' culture within the business;
- Ensure duty of care obligations are met as required under the relevant Health, Safety, Environment and Quality legislation;
- Immediately cease, and report, any workplace activity/incident (including that of other persons) which presents an immediate risk to safety, health, property or environment;
- Immediately report all hazards, incidents and injuries to their Supervisor;
- Participate in all HSE related activities (toolbox talks, risk assessments, inspections) or training as directed by their Manager/Supervisor.

Workers must take reasonable care for their own health and safety, while at work and take reasonable care that their acts or omissions do not adversely affect the health and safety of other persons. This duty is subject to a consideration of what is reasonable and what is necessarily proportionate to the control a worker is able to exercise over their work activities and work environment.

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Workers must also:

- Comply, so far as they are reasonably able, with any reasonable instruction given by the PCBU conducting a business or undertaking that allows it to comply with the WHS legislation;
- Co-operate with any reasonable policy or procedure of the PCBU that relates to work health or safety that has been notified to workers.

Contractors, sub-contractors, employees of a contractor or sub-contractor or employees of a labour hire company are defined as a 'worker' under the Health and Safety at Work Act if they carry out work in any capacity at Silverstream Landfill.

10.5 Contractors

10.5.1 ENGAGED BY WASTE MANAGEMENT

When engaging a contractor, the requirements set out in HSEQ QRG 4.1.1.01 must be followed and met.

Contractors engaged by WMNZ must complete the WMNZ Contractor Pre-Approval process. To successfully complete this process the Contractor will be required to supply Safety related documentation relevant to the tasks they will be conducting and the risk level involved.

A pre-qualified contractor register is maintained and available to all managers and other WMNZ staff who manage contractors.

As a minimum the contractor is required to provide:

- Health and Safety Policy;
- Acknowledgement of Contractor Responsibilities form;
- Evidence of adequate Insurance for the risk level of work completed.

Higher risk contractors will need to provide copies of H&S Manuals, Risk Registers, Risk Assessments and Safe Work procedures.

Small, lower risk, contractors who do not have comprehensive HSE systems will be required to work to Waste Management's HSE Management System requirements.

Annual renewal of Contractor Information is conducted to ensure currency of information.

A review of Contractor performance is conducted annually.

10.5.2 NOT ENGAGED BY WASTE MANAGEMENT (BUT WORKING AT SILVERSTEAM LANDFILL)

Contractors, sub-contractors, employees of a contractor or sub-contractor or employees of a labour hire company may be engaged by other PCBUs operating or involved at Silverstream Landfill, *for example*: Hutt City Council, LMS, Tonkin & Taylor, Geotechnics, Leach & Co, Earthlink, etc.

While the activities of the various PCBUs may not involve WMNZ directly, given that WMNZ manages the Silverstream Landfill site, these activities may impact on WMNZ and/or other PCBUs operating at on site.

Under s34(1) of the Health and Safety at Work Act 2015 *"each PCBU with the duty must, as far as reasonably practicable, consult, co-operate with, and co-ordinate activities with all other PCBUs who have a duty in relation to the same matter."*

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It is recognised that WMNZ can be responsible for only advising the nature of, and methods of controlling hazards specific to WMNZ's business and/or activities and that the PCBU shall apply best industry practice to ensure the safety of all involved at all times.

This Safety Management Plan, online Site Induction and Site Information Sheet addresses this requirement by *"advising the nature of, and methods of controlling hazards specific to Waste Management's business"* at it relates to Silverstream Landfill.

It is the responsibility of the Hutt City Council, LMS Generation, Tonkin & Taylor, Geotechnics, Leach & Co, Earthlink, and others not engaged by WMNZ to communicate the health and safety requirements for accessing and /or operating at Silverstream Landfill to their employees, consultants, contractors, sub-contractors, service providers, suppliers and visitors.

This communication could include a copy of this Safety Management Plan (SMP), online Site Induction, Site Information Sheets, and/or the Consultants, Contractors, Sub-Contractors SMP. The flowchart in Figure 1 provides a guide to what is required and by whom.

The 'Sign-in/Sign-out' procedure at the kiosk is mandatory to ALL contractors and visitors (other than members of the public travelling to and from the Transfer Station) accessing the site beyond the kiosk.

Controlled copies of the WMNZ Safety Management Plan, online Site Inductions, Site Information Sheets are available from the WMNZ Landfill Manager.

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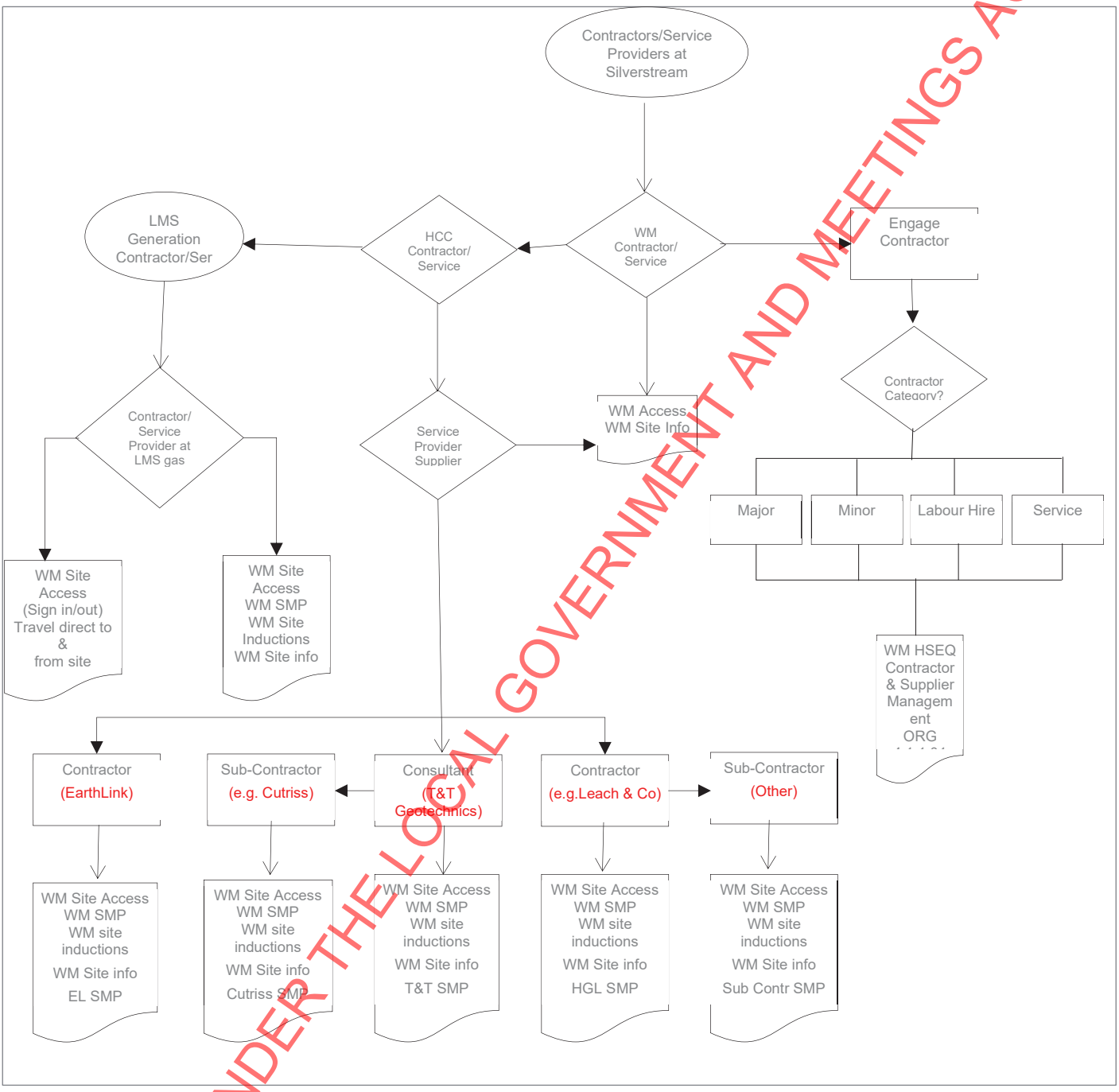
Figure 1 – Contractor/Service Provider H&S requirements flowchart



10.6 Visitors

Visitors also have responsibilities to abide by our workplace safety rules and procedures. These responsibilities include to:

- Take reasonable care for their own health and safety and for the safety of other persons;
- Comply with, so far as they are reasonably able, all reasonable safety directions provided by Silverstream Landfill staff;
- Report all safety related incidents to Landfill Manager;
- Refrain from bringing children and/or pets to Silverstream Landfill;
- Not enter any restricted area without authorisation or escort;

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- Not bring or consume alcohol or illegal drugs at Silverstream Landfill;
- Not willfully or recklessly interfere with Silverstream Landfill property.

11 COMMUNICATION & CONSULTATION ARRANGEMENTS

When undertaking communication and consultation, the requirements set out in HSEQ QRG 3.1.1.01 (Communication) & 3.1.1.02 (Consultation) must be followed and met.

11.1 Communication with WMNZ staff, contractors and visitors

Communication is conducted in various ways to ensure clear instruction and information is exchanged in different circumstances.

Work safety requirements are communicated through the use of:

- Company & Site Inductions
- Site Information Sheets (Appendix C)
- Daily toolbox briefings
- Risk Assessments
- Work Instructions
- Training
- HSE Notice Boards
- Hazard Alerts
- Information Alerts
- Top 10 Critical Risk Toolbox meetings
- HSE Focus Group meetings
- Posters
- Signage.

11.2 Communication with Contractors (not engaged by WMNZ)

Communication with Contractors involved or operating at Silverstream Landfill but not engaged by WMNZ (e.g. Tonkin & Taylor, Leach & Co, LMS, etc) will be through various meetings types, the frequency depending on the need to consult, cooperate and coordinate with these parties on general matters but primarily for safety and health.

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Meetings types, frequencies and parties involved include:

Type	Frequency	Parties involved
Site	Daily	WMNZ
Site	Monthly	WMNZ; LMS; Tonkin & Taylor; EarthLink; Leach &Co
Client	Bi monthly	WMNZ (s7(2)(a)) & Hutt City Council (Jörn Scherzer)
Silverstream Landfill Liaison Group/ H&S Meeting	Quarterly	WMNZ; LMS; Tonkin & Taylor; EarthLink; Hutt City Council, Leach &Co

11.3 Consultation

WMNZ Managers and Supervisors are required to consult their workers, so far as reasonably practicable, on matters that directly affect or are likely to directly affect the workers' health, safety or welfare.

Consultation is undertaken via the Daily Toolbox briefings

In addition, monthly 'toolbox talks' are a supplementary consultation mechanism.

Consultation is required:

- During risk management processes;
- When making decisions regarding facilities related to welfare, e.g. amenities;
- During development of HSE policies and procedures;
- When changes are proposed to:
  - The workplace;
  - Machine/equipment, substances, processes and other things used in the workplace;
  - The work performed that may affect the health and safety of workers.

Consultation shall include contractors and any workers of the contractor(s) who perform work over which the WMNZ Manager and/or Supervisor has control. This includes staff hired through labour-hire companies.

Consultation shall include:

- Sharing information with workers – information shall be made available in a timely way and shall be provided in a form that can be understood by workers;
- Giving workers a reasonable opportunity to express views about the matter – time shall be made available for workers to consider the issues and they should be encouraged to ask questions, raise safety concerns, make safety recommendations and be part of the problem-solving process;
- Taking those views of workers into account in the decision-making process;
- Advising workers of the outcome of consultation in a timely manner.

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12 ACC & ISO ACCREDITATIONS

WMNZ is part of the ACC Accredited Employer Program and continues to achieve Tertiary level accreditation under the ACC Partnership Program. Copies of certificates are provided in Appendix D. WMNZ is accredited to:

- AS/NZS 4801:2001 - Occupational Health and Safety Management Systems
- ISO 14001:2004 - Environmental Management Systems
- ISO 9001:2008 - Quality

WMNZ's aim is to continually improve workplace health, safety and welfare standards and as such we will:

- Comply with all relevant laws, regulations, and standards.
- Identify & manage hazards, eliminate unsafe behavior and conditions from the workplace.
- Address health safety and environmental implications of all operations.
- Communicate and consult with all relevant stakeholders.
- Ensure all workers take reasonable steps to prevent injury to themselves and others.
- Train and hold individuals accountable for their area of responsibility.
- Ensure active management involvement in health, safety and environmental matters
- Prepare, test and maintain emergency procedures.
- Manage risk by investigating and reporting all work related incidents, and taking corrective actions to prevent re-occurrence.
- Demonstrate commitment to an equitable end effective injury management program.
- Undertake pre-employment drug testing of all potential employees.

ENVIRONMENT ISO 14001 | Health & Safety AS/NZS 4801 | Quality ISO 9001

13 HEALTH & SAFETY MANAGEMENT SYSTEM

WMNZ is dedicated to providing exceptional health and safety performance across all aspects of our services and at all levels of our organization. The position WMNZ holds as a prominent, responsible entity, demands a high level of commitment to health and safety, and means we have a comprehensive Health, Safety, Environmental and Quality (HSEQ) Management System which is implemented across all areas of operation. WMNZ is committed to preventing harm and ensuring the health, safety and welfare of its workers, visitors, contractors and the public.

Health and safety policies and practices are firmly integrated into WMNZ's operational procedures, and are delivered to all areas of the business.

The HSEQ Management System is underpinned by an Incident Management System (The Vault) and HSEQ Management Standards which comprises of six elements that ensures that the system aligns with the requirements of AS/NZS 4801 (Safety), ISO 14001 (Environment) & ISO 9001 (Quality). These six elements are:

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- Leadership
- Operation
- Planning
- Performance Evaluation
- Support
- Improvement

The full suite of HSE Management Standards, requirements, guides, templates and forms are available on the WMNZ Safety and Sustainability Portal.

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14 SITE ACCESS

Accessing the Silverstream Landfill site requires persons to 'sign in' at the kiosk on arrival and 'sign out' at the kiosk on departure, even if the departure is of short duration. There is however an exception to this requirement as it relates to members of the public visiting the Transfer Station (including the Green Waste Area) and visitors to the Silverstream Landfill Office.

14.1 Transfer Station

Members of the public are not required to 'sign in/sign out' if they travel to and from the kiosk to the Transfer Station to discard refuse or green waste.

14.2 Silverstream Landfill Office

Persons visiting the Silverstream Landfill Office are not required to 'sign in/sign out' if they intend to remain within the Office complex and Car park.

14.3 Silverstream Landfill Site (beyond the kiosk)

Persons visiting or accessing Silverstream Landfill "beyond the kiosk" are required to follow the 'sign in/sign out' requirements. **No exceptions**.

15 CHILDREN & PETS

Children or pets are not permitted on site anywhere at Silverstream Landfill other than at the Transfer Station.

Children & pets are to remain in vehicles at all times when at the Transfer Station. **No exceptions**.

16 INDUCTION & TRAINING

When undertaking inductions and training, the requirements set out in the NZ Training Plan (HSEQ 3.4.1.03) must be followed and met.

ALL workers, i.e. employees, contractors & sub contactors (engaged by WMNZ and engaged by other PCBUs involved and/or operating at Silverstream Landfill), and labour hire staff must complete the online Silverstream Landfill Site Induction hosted at the below website:

http://www.linksafe.com.au/wmnzsilverstream/

WMNZ has an in-house Training Department to provide specialist training to WMNZ staff and contractors.

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Training can be delivered by the Training Department, by HSE Advisor, Business Instructor or external training providers.

A Training Needs Analysis is conducted annually to identify training requirements for individual employees based on the type of tasks they perform.

Training scheduled and completed for the next and previous months respectively are reviewed monthly at the HSE Focus Group meetings.

A core training plan has been developed by job position and includes:

- Company Induction
- Site Induction
- Site Emergency Awareness
- Risk Management Awareness
- Incident/event reporting
- Fatigue management
- Isolation of energy sources
- Manual Handling
- Slip Trip Fall

Specialist training provided to key employees also includes:

- Site Safe
- Wheels, Tracks, Rollers
- Confined Space Entry
- Fall Prevention (Safe Working at Height)
- Emergency Warden
- First Aid
- Approved Handler
- Approved Filler
- Permit Issuer/ Receiver
- Gas Testing

Training needs and records are managed using The Vau

17 RISK MANAGEMENT & RISK REGISTER

When undertaking risk management, the requirements set out in the HSEQ QRG 2.1.1.01 must be followed and met.

17.1 Hazard Management

WMNZ has developed and maintains a Site Risk Register for the areas and/or activities it manages at Silverstream Landfill.

The Site Risk Register identifies the areas of risk, related hazards and controls required to minimise the risk of injury or damage occurring and is available in Appendix E.

A suite of the Top 10 Critical Risks for the site has been identified and posters listing these critical risks are displayed at prominent positions throughout the site.

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These 'Top 10 Critical Risks' are:

- Collisions with moving or stationary objects or people
- Explosion
- Loss of control
- Overcome by fumes or gases
- Exposure to hazardous substances
- Insecure loads
- Exposure to uncontrolled energy
- Fall from heights
- Drug and alcohol impairment
- Accidental firearm discharge

Each Critical Risk is the topic for a monthly safety campaign.

The Critical Risk(s) for the month will be discussed in toolbox talk meetings.

Where possible, training in the Critical Risk area will be conducted.

Monthly Workplace Inspections will be conducted focusing on the Critical Risk(s).

17.2 Hazard Identification

Identification of new hazards on the site is carried out using the following methods.

- Safety Interactions
- Safety Observations
- Workplace Inspections
- Key Risk Observations
- Incident/injury reporting
- Near Miss Incident reporting
- Staff reporting of Opportunities for Improvement
- Monthly review of the Risk Registers (as part of the Top 10 Critical Risk campaign)
- Risk Assessments.

17.3 Site Procedures and Plans

Site specific plans and procedures are developed for the management of HSE. These plans are based on the requirements set out in HSEQ QRG 2.1.0.01.

Specific Site Plans and Procedures include:

- Annual Health, Safety, Environment and Sustainability Plan
- Site Traffic Management Plan
- Site Emergency Management Plan (SEMP)
- Online Site Induction procedure
- Online Company Induction procedure for WMNZ Contractors (including labour hire staff).

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17.4 Reporting Incidents/Injury/Illness/Near miss events

WMNZ requires that ALL Incidents, Injuries, Near Misses and identified Hazards are reported immediately, however small or insignificant they may appear to be. Reporting, Investigations and Corrective Actions must meet the requirements set out in HSEQ QRG 6.1.1.01.

Incidents & Injuries[1], Near Misses[2] and Hazards can be reported in the following ways.

- Verbal report (including via RT) to Supervisor or Manager;
- Direct entry into the V form (pre curser to The Vault);
- Completion of an 'Event Report' Pad forms (pads are located at the office, kiosk and mobile plant).

[1]*An incident or injury is an event that actually results in an incident, accident or injury.*

[2]*A near miss or near hit is an event that potentially could have resulted in an incident, accident or injury*

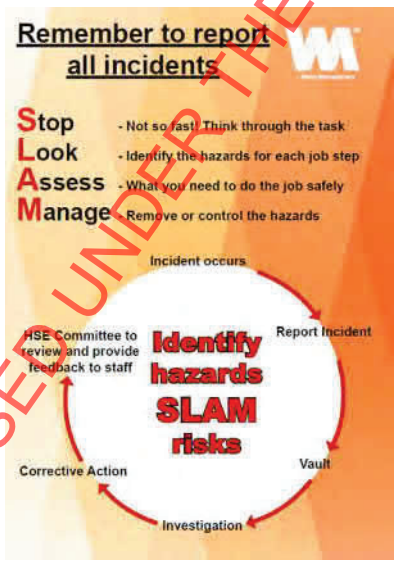
All incident and hazard reports will be investigated, and corrective actions developed to prevent reoccurrence or to minimize the risk.

Injuries requiring First Aid Treatment (FAT) will be reported to the General Manager and National HSE Manager.

All Medical Treatment Injuries (MTI) and Lost Time Injuries (LTI) will be reported to the General Manager, National HSE Manager and Managing Director immediately.

All Incidents and Injuries will be managed in The Vault. Any Incident or Injury with a severity rating of Minor or above is automatically escalated to Senior Management and an incident report is automatically emailed.

Any incident resulting in a notifiable event must be immediately reported to the WMNZ National HSE Manager and WMNZ Managing Director. The WMNZ National HSE Manager will then report the incident to Worksafe New Zealand. The WMNZ National HSE Manager will assign an Investigator to carry out the incident investigation.



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18 ENVIRONMENTAL HAZARDS

18.1 Noise

Every person working on Silverstream Landfill must wear hearing protection in areas where noise exposure may exceed 85dB over an eight hour day (e.g. working in the proximity (outside the cab) of heavy mobile plant) or 140dB in a single dose.

18.2 Landfill gas exposure

There are many constituent gases that typically are present in Landfill Gases (LFG). These gases could become combustible when mixing with air or toxic to humans. The main gases of concern are:

- Methane (CH4) – range is normally 50-60% but can be lower in gas from newer and older landfills, and can be higher in landfills with inadequate gas extraction.
- Carbon Dioxide (CO2) - range is normally 35-45%.
- Nitrogen (N2) – range is normally 5 -8%. It's inert.
- Oxygen (O2) – range is normally 0.5 – 2% but can be higher if extraction vacuum is too high. Elevated levels of O2 in LFG could bring about the onset of aerobic degradation and heating in the waste mass with the consequent potential for spontaneous combustion.

Many minor gases are also present, generally in trace amounts, but the ones of principal concern are:

- Hydrogen Sulphide (H2S) – commonly known as 'rotten egg gas' this is a toxic gas normally found in LFG at around 50 – 300 ppm but can be two orders of magnitude higher in extreme cases. This gas is highly odorous and is often the reason, together with mercaptans, why LFG has its characteristic odour.
- Carbon Monoxide (CO) – this odourless gas should be only at trace levels (<200ppm). Elevated levels are generally an indicator of incomplete combustion and a potential landfill fire.
- Non-Methane Organic Compounds (NMOC's) – this group includes a large range of volatile and semi-volatile compounds which are normally reported as a hexane equivalent at levels between 1000 and 10,000 ppm.

Given the hazards and risks associate with LFGs, the WMNZ LFG Operational Protocols provided in Appendix F must be met, **including a daily monitoring regime**.

19 DRUG & ALCOHOL FREE SITE

Every person accessing Silverstream Landfill must not be intoxicated or under the influence of any non-prescriptive drugs or alcohol while anywhere on site.

WMNZ has a ZERO TOLERANCE for drugs and alcohol at their places of work.

Drug & alcohol testing of staff and contractors includes pre-employment, random, just cause and post incident.

WMNZ must Drug & Alcohol test 10% of its Silverstream staff and contractors per month to meet Safety Sustainability and Service Plan KPIs.

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20 SMOKE FREE SITE

Silverstream Landfill is a SMOKE FREE AND Vape Free SITE. Smoking or the introduction any unintended source of ignition (naked flame, welding arcs, etc) is prohibited due to the flammable gases present on site.

21 PERSONNEL PROTECTIVE EQUIPMENT (PPE)

The type, issue and maintenance of Personal Protective Equipment (PPE) must meet the requirements set out in the HSEQ QRG 3.2.1.08.

Persons accessing Silverstream Landfill site "beyond the kiosk" (other than members of the public visiting the Transfer Station) are required to wear the appropriate Personal Protective Equipment (PPE) suitable for the task/activity to be undertaken. This is to be determined by each PCBU. As a minimum, WM persons must wear:

- Ankle to wrist cover;
- Hi visibility overall, shirt or vest (zipped up);
- Safety boots (with steel or composite toe cap).
- Hard Hat

Additional PPE may be required but this will depend on the task/activity undertaken. For details, refer to your Supervisor/Manager, Safe Work Methods (SWM), Work Instructions (WI), Job Safety Environmental Analysis (JSEAs), Safety Data Sheets (SDS), etc.

22 RESTRICTED AREAS

The following areas have been identified as restricted areas to ALL employees, contractors, service providers, suppliers and visitors to Silverstream Landfill. These restricted areas are:

- Asbestos burial sites
- Special burial sites
- Burrowing sites
- Stage 1 landfill
- Silt Ponds

Access to any of these areas requires prior permission from the Landfill Manager. **No exceptions**.

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23 DESIGNATED WORK AREAS

All employees, contractors (including engaged and not engaged by WMNZ), service personnel and visitors must stay within their designated work areas. Deviation from the designated work area must be notified to the Landfill Manager or Supervisor in advance of move.

24 OPERATING MOBILE & FIXED PLANT

Only licenced and authorised WMNZ operators are permitted to operate WMNZ fixed and mobile plant.

25 WORK INSTRUCTIONS

Work Instruction documents have been developed for all high risk tasks. These Work Instructions are used in the training of WMNZ staff and contractors.

Work instructions are reviewed at least annually and updated where needed.

New Work Instructions are developed wherever an incident or hazard investigation identifies that a Work Instruction is required to control the risk and when a new task or activity is introduced to the landfill operations.

Each Work Instruction has a corresponding Risk Assessment or Job Safety and Environmental Analysis (JSEA) where the hazards and risks associated with area or task is assessed.

Currently work instructions include (but not limited to):

- Asbestos (acceptance & burial);
- Culling birds;
- Daily stormwater monitoring;
- Fueling mobile plant;
- Landfill cover;
- Placing geofabric (at height);
- Refuse tipping operations;
- Scrap metal recovery;
- Spill response;
- Towing vehicles & mobile plant;
- Traffic spotter;
- Transfer Station operations.

26 TRAFFIC MANAGEMENT PLAN

The Traffic Management Plan (TMP) for Silverstream Landfill must meet the requirements set out in HSEQ QRG 4.2.6.01.15. The TMP is available from the Landfill Manager. In summary, the TMP requires:

- Keep to the posted speed limits;
- Acknowledge vehicles & mobile plant have ‘right of way’ in all areas on the landfill;
- Not use of mobile phones while driving;

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- Use seatbelts while driving/operating mobile plant;
- Ensure to make eye contact with the driver/operator when approaching vehicles/mobile plant and follow the 5 Metre Rule.
- All Visitors, Service Personnel and Contractors must follow the Traffic Management Plan (TMP) when driving vehicles or operating mobile plant at Silverstream Landfill:
- Follow the standard NZ Road Code everywhere on site;
- Obey all road signs, and if in doubt, give way;
- Give way to heavy vehicles and mobile plant;
- Keep to posted speed limits (30kph between the kiosk and the active tip face & 50kph between the kiosk and the Transfer Station)
- Keep to existing roads and tracks;
- Follow the 5 Metre Rule;
- Only licensed and trained drivers/operators permitted to drive/operate vehicles and/or mobile plant.

27 PERMIT TO WORK & AUTHORITIES

WMNZ requires high risk activities such as hot works, working at height, confined space entry to follow the Permit to Work & Authority regime, the requirements which are set out in HSEQ QRG 4.2.5.01. Everyone operating at Silverstream Landfill must:

- Not undertake any Hot Work, Work at Height, Confined Space Entry without a Permit to Work and Authority.
- Permit to Work and Authorities for Contactors engaged by WMNZ must be sort from the Landfill Manager.
- Permits to Work and Authorities for Contractors and Sub Contractors engaged by Hutt City Council, Tonkin & Taylor, LMS, etc (i.e. any non WMNZ Contractor) must be sort from the PCBU commissioning/requiring the work.
- WMNZ has a comprehensive Permit to Work and Authorities process and so non WMNZ contractors are welcome to use this process when managing Permit to Work activities.

28 HEALTH SURVEILLANCE & MONITORING

WMNZ undertakes Health Surveillance and Monitoring of staff according to HSEQ QRG 3.2.1.03. The Health Surveillance & Monitoring regime includes pre-employment medicals and annual health checks for:

- Lung function
- Vision
- Musculoskeletal
- Sun Awareness
- Audiometric testing (hearing testing)
- Blood pressure
- Cholesterol

29 INJURY MANAGEMENT

WMNZ follows the Injury Management Manual (HSEQ M 3.2.2.01) when managing work related injuries. WMNZ follows the ACC Partnership Programme and has engaged Gallagher Bassett as their Claims Administrator. Each WMNZ employee is provided with an ACC PP Card which is to be presented to the medical practitioner or facility following a work related injury.

A comprehensive list of alternative or light duties is available for employees who are unable to perform normal work duties following a work related injury. Weekly injury management with case managers

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(Gallagher Bassett) and the Landfill Manager ensures injured employees are rehabilitated before resuming normal duties.

30 EMERGENCY PREPAREDNESS

30.1 Site Emergency Management Plan (SEMP)

A Site Emergency Management Plan (SEMP) has been developed for Silverstream Landfill. The SEMP identifies actions to be taken in the following emergency situations:

- Fire;
- Medical Emergency;
- Personal Threat;
- External Emergency;
- Unidentified Hazardous Substance;
- Spill of Oil or Diesel or Environmental Incident;
- Natural Emergency.

The plan also lists internal and external emergency contacts and external service providers.

In addition to the SEMP, Emergency Wardens for the site have been assigned and trained. First Aid personnel have been trained and first aid kits are available throughout the site.

The names of Emergency Wardens and First Aiders are posted on the HSE Notice Boards. Six monthly Emergency Evacuation drills are conducted at the site.

The SEMP must meet the requirements set out in HSEQ PL 2.1.3.01.01. A copy of the SEMP is available in Appendix G.

30.2 Evacuation

When advised to evacuate the Landfill site:

- Follow the instructions of the wardens;
- Shut down processes and/or machinery (if it is safe to do so)
- Exit the area immediately by the nearest safe exit, WALK – DO NOT RUN;
- Assist persons requiring assistance;
- Report to the Assembly Point (Landfill Admin Office Car Park);
- Remain at the Assembly Point until the “All Clear” is given;
- If you need to contact Emergency Services, dial 111 from the office or kiosk landline. Note mobile phone coverage on site is generally poor.

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30.3 Fire Extinguishers & First Aid Kits

Fire extinguishers and first aid kits are available at the WMNZ Office, Kiosk and in mobile plant at the Tip Face and Transfer Stations.

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31 AUDITS & INSPECTIONS

WMNZ has a comprehensive internal and external audit programme in place. Internal HSE Auditing is conducted annually by members of the HSE team.

As an ACC Accredited Employer, WMNZ is required to undergo an ACC audit annually at two of its sites. Learnings and actions from these audits are implemented across all sites.

The site also holds certification in ISO 90001, ISO14001 and NZS (ISO) 4801, externally audited by Telarc.

Other inspections carried out at the site include four (4) monthly Workplace Inspections and daily Vehicle Condition Reports (pre-start vehicle checks).

32 REFERENCES

Health & Safety at Work Act 2015

ISO 9001:2008

AS/NZS 4801:2001

ISO 14001:2004

ISO 31000:2009

OHSAS 18001:2007

Waste Management HSEQ Management Standards

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Notices

Prohibition, infringement, or improvement	Reason	Corrective Action
Prohibition notice # WSNZ 17498	2017 Worksafe inspector formed a view that the site was not handling and receiving asbestos in line regulations	Site trained two workers for B class asbestos Site reviewed work instructions and risk assessments to ensure they aligned with regulations All site staff were trained in asbestos awareness Contractors bringing asbestos waste to site are now required to pre-book a disposal slot so waste area can prepare for load being tipped, and are told about disposal requirements – double wrapped, no damaged wrapping, etc Asbestos activities regularly monitored to ensure processes are being followed
Prohibition notice # WSNZ 28081	2019 Due to a workplace event that resulted in a Worksafe investigation, a notice was placed on a vehicle involved in the event (details of event are under Agency Investigation information). The notice required the COF updating, risk assessment regarding potential fall out of the truck when undertaking tasks from the left, repair of worn standing area, and consider fall prevention from vehicle	The COF expired when the truck was isolated due the event. When Worksafe attended site they requested the COF be renewed before the truck was used (COF would have been updated if the truck was in use. Expired due to being locked out) A risk assessment for operating from the left was already in place for the activity. This was reviewed, submitted to Worksafe, and approved. The floor plate in the standing well area was replaced and new monitoring procedure implemented to ensure these were part of the daily pre-start A barrier was designed and installed on the LEV. Worksafe were due to attend to the site to review and see how it worked. Worksafe never attended site and requested photos. Truck returned to work activity
Improvement notice # WSNZ 36355	2017 At a meeting between WMNZ and Worksafe, it was raised by a WMNZ manager that a hose used in an attempt to put a fire out was not long enough. Notice required a longer hose be installed	A review of all emergency equipment on site was undertaken and where required upgraded to ensure fit for purpose. Information sent to Worksafe and improvement notice lifted
Improvement notice # WSNZ 36361	2019 Improvement regarding Management of Change process not being used at site.	An independent consultant was engaged to assist and train staff on site regarding management of change (MOC) process and procedures. MOC is now reviewed monthly at management meeting to ensure process is always followed. Information sent to Worksafe and improvement notice lifted

Prohibition, infringement, or improvement	Reason	Corrective Action
Improvement notice # WSNZ 36360	2019 Improvement regarding lack of information on work instructions (WI) for packaged waste disposal. Review required to ensure WIs give adequate detail and information for user	Workshops held with managers and staff to review and improve WIs for packaged waste disposal Workers trained in revised WIs to ensure understanding and requirements Information sent to Worksafe and improvement notice lifted
Improvement notice # WSNZ 36357	2019 At a meeting between WMNZ and Worksafe, it was raised by a WMNZ Manager that there was not a formal process in place to inspect mixing pit between operations	New work instructions were developed to ensure a more formalised and documented process to prevent any further events of incompatible products creating a risk. Information sent to Worksafe and improvement notice lifted

Agency Investigation

Agency	Event	Corrective Actions
Worksafe/NZ Police No action taken	2017 A fatality occurred when a low entry vehicle was undertaking kerbside collections. Driver appeared in court as part of Police investigation and was cleared of any wrongdoing.	This was a tragic accident, the investigation found WM, the driver and vehicle held no fault for the event occurring At a Coroners inquest, it was suggested that WM consider the installation of additional safety features on the truck to assist the driver but also take in to account the risk these may cause – increased distractions to the driver. Upon considering the outcome of the Coroners inquest and testing additional safety devices, additional safety devices were implemented; - Front motion sensors - IA equipment to detect objects approaching from the rear that may enter blind spots The trucks already have blind spot oval mirrors of front and side, rear view cameras, and side view cameras. A number of these safety features were then part of WMs on-going truck build programme

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Agency	Event	Corrective Actions
Worksafe Company was sentenced November 2020 under sections 36(1)(a), 48(1) and 2(c) of the Health and Safety at Work Act 2015. No employees were prosecuted	Event date November 2017. Operating a conveyor belt with guards removed resulting in degloving of worker arm. Worker reached in to remove debris while conveyor belt was running. Guards had been removed by an external belting company and plant was not locked out in line with Waste Management's company procedures. Contractor who was engaged to manage the site on behalf of Waste Management instructed workers to operate the plant with the guards removed after being told by Senior Manager to lock out the machine and replace the guards. Contract unfortunately failed to list H&S duties and responsibilities so his actions were attributed to Waste Management Guards were fixed guarding and deemed appropriate by guarding specialists and WorkSafe during prosecution hearing.	Plant was locked out and never restarted. New state-of-the-art plant was built in Auckland. New site management team was established. Plant fitted with interlocking guarding. Lock out and tag out processes revised, and all staff trained Reiterated to people that it's ok to say 'No' if requested to do something unsafe – operate plant without guards, and you will be fully supported. National review completed on conveyor belts to ensure correct guarding place – fixed or interlocking. National culture assessment undertaken by EMT – attending random sites and conducting meetings with front line workers on what is done well and what could be done better Supported injured worker (agency employee) through rehabilitation Attempted to recruit injured worker but were unsuccessful Contractor was removed from company Belting company never used again
Worksafe Company was sentenced May 2022.	2017 – Waste Management Technical Services While mixing water that was thought to be containing heavy metals, H2S was released unexpectedly, and a staff member was exposed to a high concentration of the gas. The staff member passed away some hours after the event.	In August 2018, WorkSafe charged Waste Management under Sections 48 and 36 of the Health & Safety at Work Act for failing to comply with health and safety duties. Waste Management made an early guilty. WorkSafe fined Waste Management. Corrective actions. Following this incident, an immediate process safety review and audit was undertaken by an independent engineer for the Waste Management Technical Services division and extensive remedial actions were recommended. These have all been implemented by Waste Management.

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Agency	Event	Corrective Actions
2019 Worksafe No action taken	2019 While driving from the left-hand side position of a low entry vehicle, the driver (agency worker) has exited the truck while moving resulting in significant injury. See Prohibition notice # WSNZ 28081 covered under Notices.	The investigation identified that the driver was trained on the work instruction, risk assessment, and deemed competent to undertake the task safely. What was unknown to WM was a personal medical condition that was not declared to the agency the driver was working for, or during the pre-employment medical that had been completed (was in the process of becoming a fulltime employee for WM). It was assumed (Worksafe would not share personal medical history due to privacy laws) that the driver had a personal medical event that resulted in them losing consciousness and exiting the cab unintentionally. The vehicle the driver fell from is a low entry vehicle used for kerbside recycling or bag collections. When operating from the left, the speed of the truck is governed to approximately 45kph, has an automated braking system (when the foot is removed from the accelerator the trucks comes to stop automatically) and has a number of handhold points to ensure three points of contact are maintained at all times. The risk assessment for the task was reviewed to consider personal medical events and a fall prevention device was designed and installed to prevent someone unintentionally exiting the cab while in motion. This however then created additional risks of someone who has a medical event then potentially being stuck in the cab with their foot still on the accelerator which would result in a runaway truck. Trials continue

Notifiable events (in addition to the above investigations and prosecution)

2017	Driver crossed a railway line as a train was coming	Reported to Worksafe who passed on to TIAC.
2019	While refuelling an item of plant, a worker was hit when a excavator slewed around.	Reported to Worksafe. No action or investigation undertaken by Worksafe. Just requested copy of internal investigation and corrective action report
2020	Member of public fell while unloading waste at transfer station.	Reported to Worksafe. No action or investigation undertaken by Worksafe. Contacted member of public for confirmation of event.
2020	Member of public fell of trailer while unloading waste at transfer station	Reported to Worksafe. No action or investigation undertaken by Worksafe.
2021	Road traffic accident.	Notified Worksafe as a precaution. No involvement by Worksafe

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QUICK REFERENCE GUIDE
Contractor and Supplier Management
HSEQ Management System

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Introduction

This quick reference guide defines the commitment to a safe, healthy and environmentally responsible work environment and process for contractors undertaking work for the Company and to outline requirements for the management of contractors.

This guide is subject to and must be read in conjunction with the **Contractor and Supplier Management Standard and Procurement 'new supplier' process**.

This document outlines the HSEQ process to be followed for the commencement of a contractor or service provider, from an HSEQ perspective only.

The procedure precedes the **Procurement procedure**, whereby those allocated responsibility for contractor management evaluate the contractors' appropriate knowledge and resources to undertake the scope of contractor's work. Procurement will require evidence of contractor assessment, contractor information and insurance details before final approval as a service provider will be given.

Once work has commenced in accordance with this procedure, contractor performance must be monitored to ensure conformance to our HSEQ and Business performance standards.

All references to 'contractor personnel' includes the contractor representative, the contractor's executive officers and workers, and the subcontractor, the subcontractor's executive officers and workers, consultants and suppliers to the contractor. These conditions apply to the contractor and the contractor's personnel.

Procurement is responsible for all Contractors engaged at a national procurement level ensuring that the Contractors have completed all relevant inductions, provided insurance details and any other documentation that relates to the tasks being completed.

Branches are responsible for ensuring that all Contractors engaged by the branch have completed all required inductions, provided relevant insurance details and any other documentation required to carry out their tasks at site level. Branches should refer to the "Branch Quick Reference Guide Contractors and Suppliers" on their obligations in employing and managing contractors.

Branches are required to ensure that all contractors regardless of whoever engaged the Contractor complete Contractor online and site inductions as detailed in Table 2.

The process involved in Contractor/Supplier Management is divided into two distinct (but related) areas:

The Procurement process:

- Complete Procurement "New Supplier Request"
- Enter all relevant contractor details including, insurance details, work permits, licences, and tickets etc. into Vault under the Personnel, Contracted Worker, field and appropriate tabs and set up within appropriate systems to enable the contractor to be paid.

QUICK REFERENCE GUIDE
Contractor and Supplier Management
HSEQ Management System

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The HSEQ process:

- Evaluate Contract category – Table 1. This step enables the Contract Manager to evaluate the contract category that the potential contractor will fall into. This step is essential to be able to assess contract requirements.

- Evaluate risk of Contractor for all Minor Contractors using Contractor Risk Assessment Tool. This step enables all Minor contractors to be evaluated based on risk of task/job they are performing (considering a significant number of contracts will fall into this Category). Dependent on the risk that the Minor contractor falls into will depend on the Contract requirements.

- Contractor Requirements – Table 2. This step enables Contract Managers to fulfil their legislative obligations and duty of care by prescribing the minimum documentation required and processes to be followed prior to the Contractor starting work.

- On-going Contract management. This step enables Contract Managers to evaluate and review contractor performance and record the results. Annual review checks and post-contract review checks (as appropriate) are also required as part of the on-going management of a Contractor.

Contract Categories

Contract categories are listed in Table 1 with some examples of the type of systems the Contractor MAY have in place and examples of these types of contractors.

The type of contractor being engaged will define the processes that occur during pre-commencement, induction and ongoing monitoring (Table 2).

Table1 – Contract Categories

	Contractor			Service Provider
	Major Contractor	**Minor (High/Medium/Low) Contractor**	**Plant/Labour Hire or Sole Trader**	
HSEQ Systems	• Have their own HSEQ System that they will work under	• May or may not have own system, however will operate under WM (at WM discretion) • May have Work Instruction or JSEA	• System will either be inferior/ incomplete, or non-existent • Will operate under WM's systems • May have Work Instruction	• Unlikely to have own system • No requirement to operate to a particular HSEQ System due to nature of work • May have JSEAs
Responsibilities	• Full evaluation of contractor's own system and performance history operating under that system	• Evaluation of contractor's ability to adopt systems based on examples from other jobs • Evaluation of contractor's performance history	• Check of individual's competencies and necessary qualifications (where required) • Review JSEA – if inadequate, will adopt WM's / will assist in development	• Check of company's/ individual's competencies and necessary qualifications (where required) • Review JSEA – if inadequate, will adopt WM's / will

	Contractor			Service Provider
	Major Contractor	**Minor (High/Medium/Low) Contractor**	**Plant/Labour Hire or Sole Trader**	
	• Monitor adherence to the contractor's system	• Check of contractor's competencies and necessary qualifications (permits etc.) • Monitor adherence to system	• Full supervision - takes full accountability and risk i.e., treated as an employee	assist in development
Examples	• Responsible for full component of electrical works • Responsible for civil works • Responsible for structural works	• Discrete package of work • Firestone/Tyre fitters • Lawn mower (L) • Cleaners (L) • Crane operator (M/H dependent on tasks) • Owner Drivers	• Urgent excavator required for once-off emergency task • Painter (Sole contractor) • Note: This is not equipment hire companies	• Photocopier repair • Water cooler refill • Office Hygiene and laundry services

Contractor Requirements

Table 2 - Contractor Requirements

Contractor Category	Contract Requirements – Pre-commencement	Inductions	Performance Monitoring	Performance Review	Annual/Post Contract Review Requirements

Major	• Insurances. See *Contractor Insurance Checklist*
	• Contract in place that defines responsibilities for HSEQ and the system they are working under. If working under own system the Contractor MUST ensure all hazards, near misses, safety and environmental incidents are reported to WM Contract Manager
		• Prior to arriving on site:
		  • Online Induction
		• After arrival on site:
		  • Site Induction
		• Must attend Toolbox meetings
			• All hazards, near misses, safety and environmental incidents are reported through Vault.
			• Corrective actions are entered and tracked through to close out through Vault.
			• Weekly monitoring activities include: workplace inspections and/or critical risk or safety observation
				• HSEQ performance review MUST be reviewed at Milestone points within the Project plan
				• Performance discussions occurs monthly through Branch Management Meetings or Weekly Project meetings (if these are planned)
				• These Periodic reviews MUST be recorded in Vault.
					MUST complete Annual Review Checklist – Contractor Management
					Complete post-contract review checklist (where applicable)

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Contractor Category	Contract Requirements – Pre-commencement	Inductions	Performance Monitoring	Performance Review	Annual/Post Contract Review Requirements
	• HSEQ Management Plan - see *Major Project HSE Requirements Form*		• Included in drug and alcohol testing regime		

Minor : Evaluate risk of contractor (High, Medium and Low Risk)	• Insurances. See *Contractor Insurance Checklist*
	• High Risk Contractor must provide HSEQ Management Plan - *Major Project HSEQ Requirements Form*
	• Medium and Low Risk Contractors will be operating under WM HSEQ System but will be required to provide Work instructions, risk assessments for plant/equipment, pre-start checklists for all plant, risk assessments for hazardous chemicals and dangerous goods, electrical equipment must be tested/tagged, SDS for all chemicals bought on site, Licences/permits / qualifications
		• Prior to arriving on site:
		  • Online Induction
		• After arrival on site:
		  • Site Induction
		• Must attend Toolbox meetings
			• All hazards, near misses, safety and environmental incidents are reported through Vault.
			• Corrective actions are entered and tracked through to close out through Vault.
			• High risk – weekly monitoring activities include: workplace inspections and/or key risk observations
			• Medium and Low – monthly monitoring activities include safety interactions and/or critical risk or safety observation
			• Included in drug and alcohol testing regime
				• High risk – Quarterly HSE performance reviews through HSE Committee meeting
				• Medium and Low risk HSEQ performance reviews – reviewed on contract renewal or at least annually.
				• Annual review MUST be recorded in Vault.
					MUST complete Annual Review Checklist – Contractor Management
					
					Complete post-contract review checklist (where applicable)

Labour Hire (including Plant that comes	• Working under WM HSEQ System • For Labour hire through Randstad – Nil	• Prior to arriving on site: • Online Agency Induction	• All hazards, near misses, safety and environmental incidents are	• Annual review MUST be recorded in Vault.	MUST complete Annual Review Checklist – Contractor Management

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Contractor Category	Contract Requirements – Pre-commencement	Inductions	Performance Monitoring	Performance Review	Annual/Post Contract Review Requirements
with an Operator)	• For labour hire through Other – Insurances. See *Contractor Insurance Checklist*, licences/ permits/ qualifications • Risk assessment and work instructions for plant, pre-start checklist for all plant, electrical equipment must be tested/tagged	• After arrival on site: • Site Induction • Toolbox meetings	reported through Vault. • Corrective actions are entered and tracked through to close out through Vault • On-going monitoring – treated as employee/work er. Activities could include safety interactions or critical risk or safety observations • Included in drug and alcohol testing regime		
Service Provider	• For preferred suppliers – Nil • For non-preferred suppliers – Insurances. See *Contractor Insurance Checklist* and task specific work instructions • Must work under WM permit system (for example: air conditioning maintenance that need to access roof)	Fire extinguisher maintenance and other service providers that spend either extended periods of time on site or visit site regularly **MUST** have: • Online Contractor Induction • Site induction If a service provider is not inducted, they must be fully supervised by competent WM representative 100% of the time.	• All hazards, near misses, safety and environmental incidents are reported through Vault. • Corrective actions are entered and tracked through to close out through Vault. • For Preferred supplier - Non-conformances are reported to Procurement immediately • For non-preferred suppliers - Monitoring as per site visit most likely through a safety interaction.	• Preferred Suppliers – Procurement Process for Annual Review • For non-preferred suppliers - Annual review MUST be recorded in Vault.	MUST complete Annual Review Checklist – Contractor Management

NOTE**

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Where a HSEQ Management Plan is required, the Major Projects HSE Requirements Form shall be completed.

For Minor contractors – to evaluate the risk of a contractor, the Contractor Risk Assessment Tool shall be completed.

Where required, the Waste Management **Plant Identification and Risk Assessment Checklist** must be used if the contractor or supplier risk assessment is not adequate.

On-going Contract Management

1. Performance Monitoring
   Requirements for on-site performance monitoring includes documenting at least one of the following at intervals specified in Table 2 (Performance Monitoring):
   - Workplace Inspections (WI)
   - Critical risk observation (CRO)
   - Key risk observations (KRO)
   - Safety Interactions (SI)

2. Performance Review
   Performance reviews will be conducted by Branch Managers/Contract Managers or suitable senior site management. Performance review occurs at intervals specified in Table 2 (Performance Review) and will address the following topics as a minimum:
   - Safety and environmental incidents;
   - Drug and alcohol testing compliance;
   - Non-conformance (with service or product)
   - Monitoring results above.

   Where performance monitoring occurs at Quarterly/Monthly HSE committee meetings the review can be documented within the HSEQ Committee meeting minutes.
   Non-conformances can be documented in Vault under the "Personnel Module, Contracted Worker "Company Register" Tab, select the "specific company" then Contracted Worker Reviews, Non Compliance".

3. Annual/Project Completion Review
   Annual checks are conducted to ensure insurances, licences, competencies, work instructions and equipment are up to date and still suitable for the tasks being conducted. Completion of the **Annual Review Checklist Contractor Management** will ensure that these checks are documented.

Documenting Reviews, Non compliance Findings and Corrective Actions

The findings from performance reviews and annual checks are recorded in Vault under the "Personnel Module, Contracted Worker "Company Register" Tab, select the "specific company" then Contracted Worker Reviews, and Periodic Reviews". This gives a WM Contract Manager the ability to review the Company and attach a review or Non-compliance file to that Company. When completing this tab specify whether it is an Annual review/Quarterly Review/Periodic Review and document the results of the review.

Enter corrective actions from a contractor review into Vault within the Compliance Module, as an Audit "Contractor Review".

Enter Non-compliance corrective actions from a non-compliance report into Vault within the Compliance Module, under Monitoring as a Monitoring Non-compliance.

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QUICK REFERENCE GUIDE

Contractor and Supplier Management
HSEQ Management System

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Associated Documentation

Contractor Management Flowchart
Contractor Pre-Qualification Application Form
Health & Safety Terms for Contractors
Contractor Insurance Checklist
Major Projects HSE Requirements Form
Contractor Risk Assessment Tool
Annual/Project Completion Review Checklist Contractor Management
Plant Identification and Risk Assessment Checklist
Contractor Supplier Management Monitor / Review
Contractor Non-Conformance Report
Contractor and Supplier Branch QRG
Contractor Records Checklist
Contractor Supplier Safety Review Form
High Risk Contractor QRG
Medium Risk Contractor QRG
Low Risk Contractor QRG

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Tō tātou tāone
Our city

Appendix B

Attachment G - Financial Position Pre-Qualification Form

Attachment G – Financial Position Pre-Qualification Form

TENDER FOR:	**Silverstream Landfill Operations Contract**

(a) Corporate Structure

Tenderers must provide details of their overall corporate structure, including where a Tenderer entity sits within that corporate structure.

Please see Corporate Structure attached.

(b) Financial Position

Tenderers are to provide a financial statement for the past three (3) audited financial year(s) (if possible) to evidence the Tenderer's financial capacity to undertake the Contract Works.

1. Where a Tenderer is not the ultimate parent company, the Tenderer shall identify the ultimate parent company that will provide a parent company guarantee to the Principal in support of the Contractor's obligations under the Contract (on the form attached at Schedule 18 of the Contract). The Principal reserves the right to carry out financial due diligence on such parent company, including requesting the financial statements required by this Form.
2. In addition, Tenderers are to complete the following questionnaire providing further details where the answer is 'Yes'.
3. **Note**: each organisation involved in a joint tender must submit a separate questionnaire.

Please see Financial Statements attached.

#	Question	Answer
1)	How long has the Tenderer's organisation been in business for?	WMNZ has been operating since 1985
2)	What other projects is the Tenderer's organisation currently employed on as head contractor, and what is the approximate combined value (NZD) of such projects? The Principal is particularly interested to understand what other projects the Tenderer's organisation will be involved with during 2023.	See schedule attached (labelled Financial Position of Waste Management) explaning the Waste Management NZ Limited business including finanial credentials.
3)	Are there any significant events, matters or circumstances which may significantly affect the operations of your organisation?	No
4)	Are there any proceedings, either actual or threatened, against your organisation, its parent or any director of the organisation, its parent or associated entities or have there been any in the	Yes – please see attached schedules.

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	past five years? If so, what remedial action has been taken in respect to these proceedings?	
5)	Are there any bankruptcy or insolvency type actions (actual or threatened, including, without limitation, voluntary administration, action to wind up or other similar actions) against a director of the organisation, the organisation or its parent or associated entities, or has there been any within the past five years?	No
6)	Are there any de-registration actions against the organisation, its parent or associated entities, or have there been any in the past five years?	No
7)	Are there any factors that could adversely impact on the financial ability of your organisation to successfully perform the obligations stated in this Invitation?	No
8)	Is a merger / sale / restructure in contemplation?	Beijing Capital Group announced the sale of the Waste Management New Zealand business to Igneo Infrastructure Partners (Igneo) early this year. The sale is subject to Overseas Investment Office approval and is expected to be finalised late 2022. Igneo Infrastructure Partners is part of the First Sentier Investors Group and invests in high-quality infrastructure companies in the utilities and transport sectors across the UK, Europe, North America, Australia and New Zealand.
This questionnaire has been completed by the following person:		
Name:		s7(2)(a) [redacted]
Position:		General Manager – Lower North Island
Organisation:		Waste Management NZ Limited
Date:		3 June 2022
Signature:		s7(2)(a) [redacted]

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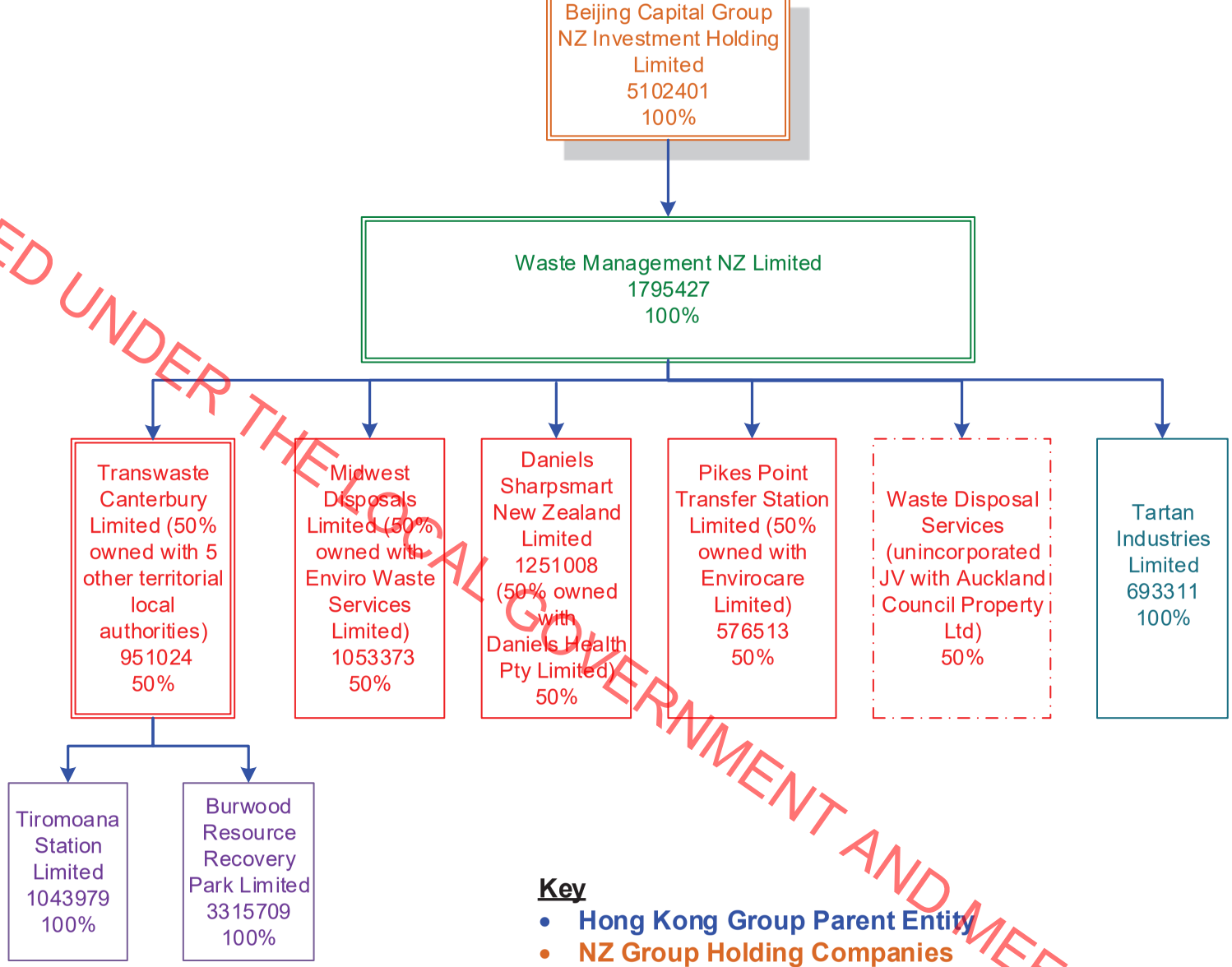

Key

- **Hong Kong Group Parent Entity**
- **NZ Group Holding Companies**
- **NZ Group Trading Entity**
- **NZ Group Active Entities (For Tax Purposes Only)**
- **NZ Group Trading Joint Ventures and Partnership**
- **Trading Subsidiaries or Joint Ventures of NZ Group Joint Ventures**

Note: Numbers recorded on the diagram are the company numbers for Com
Please refer to the separate table for IRD numbers for the relevant entities w

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BEIJING CAPITAL GROUP NZ INVESTMENT HOLDING LIMITED
AND SUBSIDIARIES

ANNUAL REPORT AND FINANCIAL STATEMENTS

FOR THE YEAR ENDED 31 DECEMBER 2021

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COMPANY DIRECTORY

Nature of Business	Company: Group:	Holding Company Waste Management Services
Company Number NZ Busines Number	5102401 9429041180495	
Registered Office	318 East Tamaki Road East Tamaki Auckland	
Directors	s7(2)(a)	(Resigned 16 August 2021) (Appointed 16 August 2021)
Shareholder	BCG NZ Investment Holding Limited	209,987,540 Shares
Auditor	Ernst & Young PO Box 2146 Auckland 1140	
Banker	ANZ Bank Bank of New Zealand HSBC Bank	
Solicitors	Brown Partners Lawyers Russell McVeagh	
Business Location	East Tamaki Auckland	

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ANNUAL REPORT

For the year ended 31 December 2021

The Board of Directors present their Annual Report including Financial Statements of the Group for the year ended 31 December 2021.

Annual Report Disclosures

A unanimous resolution was passed by the company pursuant to subsection 211(3) of the Companies Act 1993, that this annual report need not comply with paragraphs (a) and (e) to (j) of subsection 211(1) of the Act.

For and on behalf of the Board:

Director s7(2)(a) Date 07 April 2022

Director s7(2)(a) Date

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CONSOLIDATED STATEMENT OF PROFIT OR LOSS AND OTHER COMPREHENSIVE INCOME

For the year ended 31 December 2021

	NOTES	2021 $000	2020 $000 Restated *
Rendering of Services		**547,407**	503,458
Revenue	2	**547,407**	503,458
Other operating income	2	**2,763**	11,085
Subcontractor expenses		**(66,070)**	(61,504)
Disposal expenses		**(83,153)**	(75,938)
Employee expenses	4	**(123,489)**	(124,240)
Vehicle, plant and machinery operating expenses		**(44,812)**	(44,296)
Other operating expenses		**(64,525)**	(54,694)
Selling & administration expenses		**(22,315)**	(16,624)
Operating profit before financing, impairment, depreciation, associates and tax		**145,806**	137,247
Depreciation expense	7, 26	**(68,988)**	(61,452)
Amortisation expense	8	**(11,336)**	(11,241)
Impairment expense on property, plant and equipment	7	**-**	(240)
Operating profit / (loss) before financing, associates and tax		**65,482**	64,314
Net financing expenses	5	**(86,274)**	(79,606)
Share of profit of associates	10	**11,951**	8,867
Profit / (Loss) before tax		**(8,841)**	(6,425)
Income tax credit / (expense)	6	**6,045**	4,584
Net profit / (loss) for the year		**(2,796)**	(1,841)
Profit for the year from continuing operations		**(2,796)**	(1,841)
Profit for the year attributable to:			
Equity holders of the Parent		**(2,796)**	(1,841)
Other comprehensive income			
Revaluation of hedge contracts	17	**3,486**	729
Other comprehensive income for the year		**3,486**	729
Total comprehensive income for the year		**690**	(1,112)
Total comprehensive income for the year attributable to:			
Equity holders of the Parent		**690**	(1,112)
		690	(1,112)

*** Certain amounts shown here do not correspond to the 2020 financial statements and reflect adjustments made, refer to note 28**

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CONSOLIDATED STATEMENT OF CHANGES IN EQUITY

For the year ended 31 December 2021

		Attributable to the equity holders of the parent				
		Share capital $000	Hedging reserves $000	Capital note reserve $000	Retained earnings $000 Restated *	Total equity $000
Previously Reported Opening Balance - 1 January 2020		209,988	(4,324)	10,851	86,049	302,564
Restatement Adjustment		-	-	-	(1,455)	(1,455)
Opening Balance - 1 January 2020 *		209,988	(4,324)	10,851	84,594	301,109
Net profit / (loss) for the period *	16, 17	-	-	(4,589)	2,748	(1,841)
Other comprehensive income	17	-	729	-	-	729
Total comprehensive income for the period		-	729	(4,589)	2,748	(1,112)
Transactions with owners, recorded directly in equity						
Dividends to shareholders	16	-	-	-	-	-
		-	-	-	-	-
Closing Balance - 31 December 2020 *		209,988	(3,595)	6,262	87,342	299,997

		Share capital $000	Hedging reserves $000	Capital note reserve $000	Retained earnings $000	Total equity $000
Opening Balance - 1 January 2021		**209,988**	**(3,595)**	**6,262**	**87,342**	**299,997**
Net profit / (loss) for the year	16, 17	**-**	**-**	**(3,409)**	**613**	**(2,796)**
Other comprehensive income	17	**-**	**3,486**	**-**	**-**	**3,486**
Total comprehensive income for the year		**-**	**3,486**	**(3,409)**	**613**	**690**
Transactions with owners, recorded directly in equity						
Dividends to shareholders	16	**-**	**-**	**-**	**-**	**-**
		-	**-**	**-**	**-**	**-**
Closing Balance - 31 December 2021		**209,988**	**(109)**	**2,853**	**87,955**	**300,687**

*** Certain amounts shown here do not correspond to the 2020 financial statements and reflect adjustments made, refer to note 28**

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CONSOLIDATED STATEMENT OF FINANCIAL POSITION

As at 31 December 2021

	NOTES	2021 $000	2020 $000 Restated *
ASSETS			
Non current assets			
Investment in associates	10	**93,101**	96,351
Property, plant and equipment	7	**412,996**	414,881
Right of use assets	26	**287,834**	278,405
Intangible assets	8	**711,012**	718,250
Emission units		**12,222**	9,081
		1,517,165	1,516,968
Current assets			
Cash and cash equivalents	13	**28,354**	26,021
Trade and other receivables	14	**55,898**	61,047
Prepayments		**5,079**	4,124
Inventory		**4,614**	2,560
Property held for resale	15	**2,813**	831
Taxation refund		**2,645**	-
		99,403	94,583
TOTAL ASSETS		**1,616,568**	1,611,551
EQUITY			
Share capital	16	**209,988**	209,988
Reserves	17	**2,744**	2,667
Retained earnings	16	**87,955**	87,342
Equity Attributable to equity holders of the Parent		**300,687**	299,997
TOTAL EQUITY		**300,687**	299,997
LIABILITIES			
Non current liabilities			
Closure and post closure provisions	19	**50,481**	54,187
Lease liabilities	26	**289,227**	277,021
Derivative financial instruments - financial liabilities	25	**-**	133
Deferred taxation	12	**66,785**	71,692
Loans from related parties	18	**140,231**	130,098
		546,724	533,131
Current liabilities			
Interest bearing loans and borrowings	18	**20,000**	30,000
Loans from related parties	24	**632,219**	637,020
Trade and other payables	20	**70,220**	61,589
Employee related accruals and provisions		**16,075**	16,127
Provision for taxation		**-**	244
Revenue received in advance		**13,155**	16,603
Lease liabilities	26	**17,336**	11,585
Derivative financial instruments - financial liabilities	25	**152**	5,255
		769,157	778,423
TOTAL LIABILITIES		**1,315,881**	1,311,554
TOTAL EQUITY AND LIABILITIES		**1,616,568**	1,611,551

*** Certain amounts shown here do not correspond to the 2020 financial statements and reflect adjustments made, refer to note 28**

This statement should be read in conjunction with the notes to the financial statements which are included on pages 9-27

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CONSOLIDATED STATEMENT OF CASH FLOWS

For the year ended 31 December 2021

	NOTES	2021 $000	2020 $000 Restated *
Cash Flows from Operating Activities			
Profit Before Tax		**(8,841)**	(6,425)
Adjustments for:			
Depreciation of;			
- Property, plant and equipment	7	**55,909**	52,092
- Right of use assets	26	**13,079**	9,360
Impairment of Fixed Assets	7	**-**	240
Amortisation and Impairment of Intangible Assets	8	**11,336**	11,241
Loss/(Gain) on sale of property, plant and equipment	2, 3	**(666)**	(184)
Unrealised foreign exchange gains/(loss)		**(130)**	433
Share of profit of associates	10	**(11,951)**	(8,867)
Impairment loss on trade receivables	3	**4,254**	1,409
Net financing expenses	5	**86,274**	79,606
		149,264	138,905
(Increase)/Decrease in Inventories		**(2,054)**	(130)
(Increase)/Decrease in Prepayments		**(955)**	390
(Increase)/Decrease in Operating Receivables		**866**	17,854
(Increase)/Decrease in Property held for resale	15	**(1,982)**	1,229
(Increase)/Decrease in Emission units		**2,357**	2,945
(Decrease)/Increase in Operating Payables		**10,425**	(3,197)
(Decrease)/Increase in Employee related accruals and provisions		**(54)**	6,615
(Decrease)/Increase in Revenue received in advance		**(3,448)**	(2,178)
(Decrease)/Increase in Derivative financial instruments	25	**-**	(101)
(Decrease)/Increase in Lease liabilities		**-**	(219)
Decrease in Closure and post closure provisions	19	**(1,757)**	(707)
		152,662	161,406
Interest Paid		**(1,351)**	(1,237)
Interest Received		**49**	42
NRWT Paid		**(5,744)**	(5,796)
Emissions Units Acquired		**(5,498)**	(2,858)
Taxes Paid		**(3,500)**	(3,876)
Net Cash Flows from Operations		**136,618**	147,681
Cash Flows from Investing Activities			
Proceeds from sale of property, plant and equipment		**1,909**	1,091
Purchases of items of property, plant and equipment		**(65,193)**	(59,784)
Purchases of items of intangible assets	8	**-**	(129)
Dividends from associates	10	**15,200**	8,650
Net cash flows used in investing activities		**(48,084)**	(50,172)
Cash Flows from Financing Activities			
New Bank Loans		**-**	10,600
Repayment of Bank Loans		**(10,000)**	(23,000)
Intercompany Loan paid		**(8,127)**	(9,833)
Interest paid		**(61,481)**	(38,540)
Principal portion of lease payment / finance lease rental payments		**(6,593)**	(5,715)
Net Cashflows (used in)/from financing activities		**(86,201)**	(66,488)
Closing Balance of Cash on Hand		**28,354**	26,021
Minus: Opening Balance of Cash		**26,021**	(5,000)
Net Increase/(Decrease) of Cash and Cash Equivalents		**2,333**	31,021

*** Certain amounts shown here do not correspond to the 2020 financial statements and reflect adjustments made, refer to note 28**

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NOTES TO THE CONSOLIDATED FINANCIAL STATEMENTS
For the year ended 31 December 2021

1 SIGNIFICANT ACCOUNTING POLICIES AND ACCOUNTING JUDGEMENTS

Reporting Entity
Beijing Capital Group NZ Investment Holding Limited (the "Company") is a limited liability company incorporated and domiciled in New Zealand.

The Company, its subsidiaries, associates, and joint ventures comprise the Beijing Capital Group NZ Investment Holding Group (the "Group"). The immediate parent of the Group is BCG NZ Investment Holding Limited based in Hong Kong. The ultimate parent of the Group is Beijing Capital Group Co., Limited which is ultimately controlled by the State-owned Assets Supervision and Administration Commission of the Chinese Government.

The Company is a holding company and the Group provides waste management services.

The Company was incorporated and registered under the Companies Act 1993 on 20 May 2014.

The Financial Statements of the Group are for the year ended 31 December 2021.

Statement of Compliance
The consolidated financial statements of the group comply with New Zealand Equivalents to International Financial Reporting Standards Reduced Disclosure Regime (NZ IFRS RDR).

Basis of Preparation
These general purpose financial reports have been prepared in accordance with New Zealand Generally Accepted Accounting Practice (NZ GAAP). For the purposes of complying with NZ GAAP the entity is a for-profit-entity.

The Group is a Tier 2 for-profit entity and has elected to report in accordance with Tier 2 For-Profit Accounting Standards. The Group is eligible to report in accordance with Tier 2 For-Profit Accounting Standards on the basis that it does not have public accountability and is not a large-for-profit public sector entity

The Financial Statements comprise the Consolidated Financial Statements of the Group.

Basis of Measurement
The Financial Statements are prepared on the historical cost basis except that the following assets and liabilities are stated at their fair value: forward commodity contracts. These Financial Statements are presented in New Zealand dollars ("NZD") and all value are rounded to the nearest thousand ($000), except when otherwise stated.

Significant Accounting Policies
The accounting policies set out below have been consistently applied to all periods presented in these Financial Statements, except as described below.

Changes in Accounting Policies
Implementation costs relating to Software as a Service (SAAS) platforms (Restatement)
In April 2021, IFRIC issued an agenda decision clarifying its interpretation on how current accounting standards apply to configuration and customisation costs incurred in implementing Software-as-a-Service ('SaaS') cloud computing arrangements. The IFRIC decision has clarified that because SaaS arrangements are service contracts that provide the Group with the right to access the cloud provider's application software over the contract period, costs to configure or customise this software should be recognised as operating expenses when the services are received. The Group's current accounting policy is to record these configuration and customisation costs as part of the asset costs and amortise these costs over the useful life of the assets. The Group has completed a review process and has adjusted the impact of this agenda decision on its financial statements.

The Group previously capitalised costs incurred in configuring or customising a supplier's application software in a cloud-based computing arrangement, commonly known as Software as a Service (SAAS) arrangements, as assets as the Group considered that it would benefit from those costs over the life of the asset.

The Group has updated its accounting policy to comply with the IFRIC agenda decision, which is to recognise those costs as assets only if the configuration or customisation activities creates an asset that the Group controls and the asset meets the recognition criteria under NZ IAS 38. Costs that do not result in intangible assets are expensed as incurred, including costs incurred to access, configure and customise unrestricted use SAAS arrangements.

The impact of this change is detailed in Note 29 below.

There have been no other changes in accounting policies adopted during the year.

Basis of Consolidation
The consolidated Financial Statements comprise the Financial Statements of Beijing Capital Group NZ Investment Holding Limited and its subsidiaries as at and for the year ended 31 December 2021. Interests in associates are equity accounted and are not part of the consolidated Group.

Subsidiaries are all those entities over which the Group has the power to govern the financial and operating policies so as to obtain benefits from their activities. The existence and effect of potential voting rights that are currently exercisable or convertible are considered when assessing whether a group controls another entity.

The Financial Statements of the subsidiaries are prepared for the same reporting year as the Parent Company, using consistent accounting policies. In preparing the consolidated Financial Statements, all intercompany balances and transactions, income and expenses, and profits and losses resulting from intra-group transactions have been eliminated in full.

Subsidiaries are fully consolidated from the date on which control is obtained by the Group and cease to be consolidated from the date on which control is transferred out of the Group.

The acquisition of subsidiaries is accounted for using the acquisition method of accounting. The acquisition method of accounting involves recognising at acquisition date, separately from goodwill, the identifiable assets acquired, the liabilities assumed and any non-controlling interest in the acquire. The identifiable assets acquired and the liabilities assumed are measured at their acquisition date fair value.

The difference between the above items and the fair value of the consideration (including the fair value of any pre-existing investment in the acquiree) is goodwill or a discount on acquisition.

A change in the ownership interest of a subsidiary that does not result in a loss of control, is accounted for as an equity transaction.

Profit or loss and each component of other comprehensive income are attributed to the owners (equity holders of the Group) and to the non-controlling interest even if that results in the non-controlling interest having a deficit balance.

If the Group loses control over a subsidiary, it:
- Derecognises the assets (including goodwill) and liabilities of the subsidiary;
- Derecognises the carrying amount of any non-controlling interest;
- Derecognises the cumulative foreign currency translation difference, recorded in reserves;
- Recognises the fair value of any consideration received;
- Recognises the fair value of any investment retained;
- Recognises any surplus or deficit in the Statement of Profit or Loss; and
- Reclassifies the parent's share of components previously recognised in other comprehensive income to the Statement of Profit or Loss.

Acquisition or disposal during the year
Where an entity becomes or ceases to be part of the Group during the year, the results of that entity are included in the Group results from the date of acquisition or up to the date of disposal.

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Basis of Consolidation (continued)

Business combinations

Business combinations are accounted for using the acquisition method. The consideration transferred in a business combination shall be measured at fair value, which shall be calculated as the sum of the acquisition date fair values of the assets transferred by the Group, the liabilities incurred by the Group to former owners of the acquiree and the equity issued by the Group, and the amount of any non-controlling interest in the acquiree. For each business combination, the Group measures the non-controlling interest in the acquiree either at fair value or at the proportionate share of the acquiree's identifiable net assets. Acquisition related costs are expensed as incurred.

When the Group acquires a business, it assesses the financial assets and liabilities assumed for appropriate classification and designation in accordance with the contractual terms, economic conditions, the Group's operating or accounting policies and other pertinent conditions as at the acquisition date.

If the business combination is achieved in stages, the acquisition date fair value of the Group's previously held equity interest in the acquiree is remeasured at fair value as at the acquisition date through the Statement of Profit or Loss.

Any contingent consideration to be transferred by the Group will be recognised at fair value at the acquisition date. Subsequent changes to the fair value of the contingent consideration which is deemed to be an asset or liability will be recognised in accordance with NZ IFRS 9 in the Statement of Profit or Loss. If the contingent consideration is classified as equity, it shall not be remeasured.

Business combinations of commonly controlled entities

Business combinations involving entities or businesses under common control are those in which all of the combining entities or businesses are ultimately controlled by the same party or parties both before and after the business combination.

Assets and liabilities assumed in business combinations of commonly controlled entities are measured initially at acquisition date at the book value of the acquired entities. Any difference between the cost of acquisition and the book values of the assets and liabilities acquired is recorded directly in equity.

Investment in Associates, Joint Ventures and Joint Operations

An associate is an entity over which the Company has significant influence. Significant influence is the power to participate in the financial and operating policy decisions of the investee, but is not control or joint control those policies.

A joint venture is a type of joint arrangement whereby the parties that have joint control of the arrangement have rights to the net assets of the joint venture. Joint control is the contractually agreed sharing of control of an arrangement, which exists only when decisions about the relevant activities require unanimous consent of the parties sharing control.

The Group's investments in associates and joint ventures are stated in the consolidated statement of financial position at the Group's share of net assets under the equity method of accounting, less any impairment losses.

The assets, liabilities, revenues and expenses relating to the Group's interest in a joint operation are accounted for in accordance with the applicable reporting standards as detailed throughout these significant accounting policies and accounting judgements Notes to the Consolidated Financial Statements.

Foreign Currency Translations

The Financial Statements are presented in NZD, which is the Company's functional and presentation currency. All foreign currency transactions and hedges are translated to NZD at the exchange rates prevailing on the day of the transaction and any gains or losses on settlement are recognised in the Statement of Profit or Loss at the time of settlement. All foreign currency assets and liabilities are converted to NZD at the rate applicable at the date of the Statement of Financial Position.

Revenue

Revenue from the rendering of services is recognised inline with the service agreements or contract terms upon delivery of services to the customer. Revenue from the sale of goods is recognised inline with the service agreements or contract terms upon delivery of goods to the customer.

Revenue from contracts with customers is recognised when the control of goods or services is transferred to the customers, at an amount that reflects the consideration to which the Group expects to be entitled in exchange for those goods or services.

When the consideration in a contract includes a variable amount, the amount of consideration is estimated to be that which the Group will be entitled in exchange for transferring the goods or services to the customer. The variable consideration is estimated at contract inception and constrained until it is highly probable that a significant revenue reversal in the amount of cumulative revenue recognised will not occur when the associated uncertainty with the variable consideration is subsequently resolved.

When the contract contains a financing component which provides the customer a significant benefit of financing the transfer of goods or services to the customer for more than one year, revenue is measured at the present value of the amount receivable, discounted using the discount rate that would be reflected in a separate financing transaction between the Group and the customer at contract inception. When the contract contains a financing component which provides the Group a significant financial benefit for more than one year, revenue recognised under the contract includes the interest expense accreted on the contract liability under the effective interest method. For a contract where the period between the payment by the customer and the transfer of the promised goods or services is one year or less, the transaction price is not adjusted for the effects of a significant financing component, using the practical expedient in NZ IFRS 15.

Contracts for services

Contract revenue on the rendering of services comprises the agreed contract amount. Costs of rendering services comprise labour and other costs of personnel directly engaged in providing the services and attributable overheads.

Contract balances

Contract assets

A contract asset is the right to consideration in exchange for goods or services transferred to the customer. If the Group performs by transferring goods or services to a customer before the customer pays consideration or before payment is due, a contract asset is recognised for the earned consideration that is conditional.

Trade receivables

A receivable represents the Group's right to an amount of consideration that is unconditional (i.e., only the passage of time is required before payment of the consideration is due).

Contract liabilities

A contract liability is the obligation to transfer goods or services to a customer for which the Group has received consideration (or an amount of consideration is due) from the customer. If a customer pays consideration before the Group transfers goods or services to the customer, a contract liability is recognised when the payment is made or the payment is due (whichever is earlier). Contract liabilities are recognised as revenue when the Group performs under the contract.

Government Grant

Government grants are recognised where there is reasonable assurance that the grant will be received and all attached conditions will be complied with. When the grant relates to an expense item, it is recognised as income on a systematic basis over the periods that the related costs, for which it is intended to compensate, are expensed.

When the grant relates to an asset, it is recognised as a reduction in the carrying amount of the asset. The grant is then recognised in profit or loss over the useful life of the depreciable asset by way of a reduced depreciation charge.

Other income

Interest income is recognised on an accrual basis using the effective interest method by applying the rate that exactly discounts the estimated future cash receipts over the expected life of the financial instrument or a shorter period, when appropriate, to the net carrying amount of the financial asset.

Dividend income is recognised when the shareholders' right to receive payment has been established, it is probable that the economic benefits associated with the dividend will flow to the Group and the amount of the dividend can be measured reliably.

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Goods and Services Tax
All statements are exclusive of Goods and Services Tax ("GST") except receivables and payables which are shown as GST inclusive.

Leases
Lessee
A contract is, or contains, a lease if the contract conveys a right to control the use of an identified asset for a period of time in exchange for consideration. Control is conveyed where the customer has both the right to obtain substantially all of the economic benefits from use of the identified asset and the right to direct the use of the identified asset. All leases with a term of more than 12 months are recognised as assets representing the right of use of the underlying asset and liabilities representing the obligation to make lease payments, unless the underlying asset is of low value. Both the assets and the liabilities are initially measured on a present value basis. Right-of-use assets are recognised under property, plant and equipment and are measured at cost or valuation less any accumulated depreciation and impairment losses, and adjusted for any remeasurement of the lease liabilities. Right-of-use assets are depreciated on a straight-line basis over the shorter of the useful lives of the assets and the lease terms. Lease liabilities are initially measured at the present value of lease payments to be made under the lease terms and subsequently adjusted by the effect of the interest on and the settlement of the lease liabilities, and the re-measurement arising from any reassessment of the lease liabilities or lease modifications.

Lessor
Where the Group is the lessor, assets leased by the Group are included in non-current assets, and rentals receivable are credited to the statement of profit or loss on the straight-line basis over the lease terms.

Cash and Cash Equivalents
Cash and cash equivalents in the Statement of Financial Position comprise cash at bank and on hand, and short-term deposits with an original maturity of three months or less.

Inventories
Inventories are stated at the lower of cost or net realisable value. Net realisable value is the estimated selling price in the ordinary course of business, less the estimated costs of completion and selling expenses. Costs include the purchase price plus an appropriate proportion of overhead expenditure incurred by the Group. Cost is based on the weighted average cost method and includes expenditure incurred in acquiring the inventories and bringing them to their existing location and condition.

Trade and Other Receivables
Trade and other receivables are stated at their cost less impairment losses. Trade and other receivables in overseas currency are converted at the end of year rates of exchange. Any debts considered uncollectable are written off to bad debt expense.

The Group applies the simplified approach to provide for expected credit losses prescribed by NZ IFRS 9, which permits the use of the lifetime expected losses for all trade receivables. To measure the expected credit losses, trade receivables have been grouped based on shared credit risk characteristics. Future cash flows for each group of receivables are estimated on the basis of historical loss experience, adjusted to reflect the effects of current conditions as well as forward looking information. Management has closely monitored the credit qualities and the collectability of the trade receivables. Trade receivables in dispute are assessed individually for impairment to determine whether specific loss allowance provisions are required.

Trade and Other Payables
Trade and other payables are carried at amortised cost and due to their short term nature they are not discounted. They represent liabilities for goods and services provided to the Company prior to the end of the financial year that are unpaid and arise when the Company becomes obliged to make future payments in respect of the purchase of these goods and services. The amounts are unsecured and are usually paid within 30 days of recognition.

Property, Plant and Equipment
Depreciation
Depreciation is provided on a straight line basis on all fixed assets, at rates calculated to allocate the asset cost less estimated residual value, over their useful lives. The estimated useful lives of property, plant and equipment are:

	Life in years
Building and site improvements	15 - 25
Leasehold improvements	3 - 10
Plant, machinery and containers	5 - 15
Vehicles and related equipment	3 - 15
Office equipment, furniture and fittings	3 - 5

The residual value of assets is re-assessed annually.

The depreciation of landfill development costs is based on the total anticipated waste volume of the landfill concerned. The depreciation amount is calculated on that portion of total landfill costs represented by the waste volume consumed for the financial year as compared to the total volume.

Future landfill site restoration and aftercare costs capitalised are depreciated at rates that match the pattern of benefits expected to be derived from the respective sites.

Intangible Assets
Goodwill
Goodwill represents the excess of the cost of an acquisition over the fair value of the Group's share of the net identifiable assets of the acquired business, subsidiary or associate at the date of acquisition. Goodwill on the acquisition of businesses or subsidiaries is included in intangible assets. Goodwill on acquisition of associates is included in investments in associates. Goodwill is not amortised. Instead goodwill is tested for impairment annually or more frequently if events or changes in circumstances indicate that it might be impaired, and is carried at cost less accumulated impairment losses. Gains and losses on the disposal of an entity include the carrying amount of goodwill relating to the entity sold.
Goodwill is allocated to cash-generating units (or groups of cash generating units) for the purpose of impairment testing.

Other Intangibles
Intangible assets acquired separately or in a business combination are initially measured at cost. The cost of an intangible asset acquired in a business combination is its fair value as at the date of acquisition. Following initial recognition, intangible assets are carried at cost less any accumulated amortisation and any accumulated impairment losses. Internally generated intangible assets are not capitalised and expenditure is recognised in the Statement of Profit or Loss in the year in which the expenditure is incurred. The useful lives of intangible assets are determined as either finite or indefinite.
Intangible assets with finite lives are amortised over the useful life and tested for impairment when there is an indication that the intangible asset may be impaired. The amortisation year and the amortisation method for an intangible asset with a finite useful life is reviewed annually. The amortisation expense for intangible assets with finite lives is recognised in the Statement of Profit or Loss in the expense category consistent with the function of the intangible asset.

Intangible assets with indefinite useful lives (other than goodwill) are tested for impairment annually, either individually or at the cash-generating unit level. Such intangibles are not amortised.

Impairment
The carrying amounts of the Company's assets are reviewed at each balance date to determine whether there is any indication of impairment. If any such indication exists, the assets recoverable amount is estimated.

If the estimated recoverable amount of an asset is less than its carrying amount, the asset is written down to its estimated recoverable amount and an impairment loss is recognised in the Statement of Profit or Loss.
Estimated recoverable amount of investments and receivables carried at amortised cost is calculated as the present value of estimated future cash flows, discounted at their original effective interest rate. Receivables with a short duration are not discounted. The estimated recoverable amount of other assets is the greater of their fair value less costs to sell and value in use. Value in use is determined by estimating future cash flows from the use and ultimate disposal of the asset and discounting these to their present value using a pre-tax discount rate that reflects current market rates and the risks specific to the assets.

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Emission units
The Group purchases emission units ("EU's") in order to satisfy the obligations in relation to the discharge of methane from the landfills under the Emissions Trading Scheme

EU's purchased are initially measured at cost. Following initial recognition all EU's are carried at cost less any accumulated impairment.

The useful life of EU's are assessed as being a mix of fixed term and indefinite life units and are not amortised.
EU's are tested for impairment annually. When the recoverable amount of EU's is less than the carrying amount, an impairment loss is recognised.

The Group is required to surrender New Zealand Units (NZUs) for their emission obligations under the New Zealand Emissions Trading Scheme. The Group has adopted the net liability/ carrying value approach whereby a provision is recognised for the cost of settlement based on the carrying values of NZUs already held and the cost of buying NZUs when the actual emission obligation exceeds NZUs held by the Group. Where NZUs are purchased from other parties they are recorded at cost. Movements in the carrying value of the emissions liability are recognised in the Statement of Profit or Loss.

Employee Benefits
The liability for employee benefits comprises principally of annual, statutory and long service leave accruals payable at balance date. Annual leave and sick leave are recorded at the undiscounted amount expected to be paid for the entitlement earned. For sick leave, this is based on the unused entitlement accumulated at balance date and expected to be utilised in the future.

Income Tax
The income tax expense charged to the Statement of Profit or Loss includes both the current year's provision and the income tax effect of:
• Taxable temporary differences, except those arising from initial recognition of goodwill and other assets that are not depreciated; and
• Deductible temporary differences to the extent that it is probable that they will be utilised.

Current tax assets and liabilities for the current and prior years are measured at the amount expected to be recovered from or paid to the taxation authorities based on the current year's taxable income. The tax rates and tax laws used to compute the amount are those that are enacted or substantively enacted by the reporting date.

Tax effect accounting is applied on a comprehensive basis to all temporary differences using the liability method. A deferred tax asset is only recognised to the extent that it is probable there will be future taxable profit to utilise the temporary differences. Temporary differences arising from transactions, other than business combinations, affecting neither accounting profit nor taxable profit are ignored.

Deferred tax is not recognised on temporary differences associated with investments in subsidiaries because:
• The parent company is able to control the timing of the reversal of the differences; and
• They are not expected to reverse in the foreseeable future.

Deferred income tax assets and liabilities are measured at the tax rates that are expected to apply to the year when the asset is realised or the liability is settled, based on tax rates (and tax laws) that have been enacted or substantively enacted at the reporting date.

Deferred tax assets are offset only if a legally enforceable right exists to set off current assets against current tax liabilities and the deferred tax assets and liabilities relate to the same taxable entity and authority.

Financial Instruments
Financial instruments are recognised in the Statement of Financial Position when the Company becomes party to a financial contract. They include the following individual classes of assets and liabilities:

Financial assets
Initial recognition and measurement
Financial assets are classified, at initial recognition, as subsequently measured at amortised cost, fair value through other comprehensive income (OCI), and fair value through profit or loss.

The classification of financial assets at initial recognition depends on the financial asset's contractual cash flow characteristics and the Group's business model for managing them. With the exception of trade receivables that do not contain a significant financing component or for which the Group has applied the practical expedient, the Group initially measures a financial asset at its fair value plus, in the case of a financial asset not at fair value through profit or loss, transaction costs. Trade receivables that do not contain a significant financing component or for which the Group has applied the practical expedient are measured at the transaction price as disclosed in Revenue from contracts with customers.

In order for a financial asset to be classified and measured at amortised cost or fair value through OCI, it needs to give rise to cash flows that are 'solely payments of principal and interest (SPPI)' on the principal amount outstanding. This assessment is referred to as the SPPI test and is performed at an instrument level. Financial assets with cash flows that are not SPPI are classified and measured at fair value through profit or loss, irrespective of the business model.

The Group's business model for managing financial assets refers to how it manages its financial assets in order to generate cash flows. The business model determines whether cash flows will result from collecting contractual cash flows, selling the financial assets, or both. Financial assets classified and measured at amortised cost are held within a business model with the objective to hold financial assets in order to collect contractual cash flows while financial assets classified and measured at fair value through OCI are held within a business model with the objective of both holding to collect contractual cash flows and selling.

Purchases or sales of financial assets that require delivery of assets within a time frame established by regulation or convention in the market place (regular way trades) are recognised on the trade date, i.e., the date that the Group commits to purchase or sell the asset.

Subsequent measurement
For purposes of subsequent measurement, financial assets are classified in four categories:
► Financial assets at amortised cost (debt instruments)
► Financial assets at fair value through OCI with recycling of cumulative gains and losses (debt instruments)
► Financial assets designated at fair value through OCI with no recycling of cumulative gains and losses upon derecognition (equity instruments)
► Financial assets at fair value through profit or loss

Financial assets at amortised cost (debt instruments)
Financial assets at amortised cost are subsequently measured using the effective interest (EIR) method and are subject to impairment. Gains and losses are recognised in profit or loss when the asset is derecognised, modified or impaired. The Group's financial assets at amortised cost includes trade receivables and loan to an associate.

Financial assets at fair value through OCI (debt instruments)
For debt instruments at fair value through OCI, interest income, foreign exchange revaluation and impairment losses or reversals are recognised in the statement of profit or loss and computed in the same manner as for financial assets measured at amortised cost. The remaining fair value changes are recognised in OCI. Upon derecognition, the cumulative fair value change recognised in OCI is recycled to profit or loss. The Group's debt instruments at fair value through OCI includes investments in quoted debt instruments included under other non-current financial assets.

Financial assets designated at fair value through OCI (equity instruments)
Upon initial recognition, the Group can elect to classify irrevocably its equity investments as equity instruments designated at fair value through OCI when they meet the definition of equity under NZ IAS 32 Financial Instruments: Presentation and are not held for trading. The classification is determined on an instrument-by-instrument basis. Gains and losses on these financial assets are never recycled to profit or loss. Dividends are recognised as other income in the statement of profit or loss when the right of payment has been established, except when the Group benefits from such proceeds as a recovery of part of the cost of the financial asset, in which case, such gains are recorded in OCI. Equity instruments designated at fair value through OCI are not subject to impairment assessment. The Group elected to classify irrevocably its non-listed equity investments under this category.

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Financial Instruments (continued)

Financial assets at fair value through profit or loss

Financial assets at fair value through profit or loss are carried in the statement of financial position at fair value with net changes in fair value recognised in the statement of profit or loss. This category includes derivative instruments and listed equity investments which the Group had not irrevocably elected to classify at fair value through OCI. Dividends on listed equity investments are recognised as other income in the statement of profit or loss when the right of payment has been established.

A derivative embedded in a hybrid contract, with a financial liability or non-financial host, is separated from the host and accounted for as a separate derivative if: the economic characteristics and risks are not closely related to the host; a separate instrument with the same terms as the embedded derivative would meet the definition of a derivative; and the hybrid contract is not measured at fair value through profit or loss. Embedded derivatives are measured at fair value with changes in fair value recognised in profit or loss. Reassessment only occurs if there is either a change in the terms of the contract that significantly modifies the cash flows that would otherwise be required or a reclassification of a financial asset out of the fair value through profit or loss category.

Derecognition

The Group applies the expected credit loss model on all the financial assets that are subject to impairment, financial guarantee contracts, contract assets under NZ IFRS 15 and lease receivables under NZ IFRS 16. For trade receivables and contract assets without a significant financial component, the Group applies the simplified approach which requires impairment allowances to be measured at lifetime expected credit losses.

For other financial assets, impairment allowances are recognised under the general approach where expected credit losses are recognised in two stages. For credit exposures where there has not been a significant increase in credit risk since initial recognition, the Group is required to provide for credit losses that result from possible default events within the next 12 months. For those credit exposures where there has been a significant increase in credit risk since initial recognition, a loss allowance is required for credit losses expected over the remaining life of the exposure irrespective of the timing of the default.

The Group considers a default has occurred when a financial asset is more than 90 days past due unless the Group has reasonable and supportable information to demonstrate that a more appropriate default criterion should be applied.

Financial assets are derecognised when the rights to receive cash flows from the assets have expired; or where the Group has transferred its contractual rights to receive the cash flows of the financial assets and has transferred substantially all the risks and rewards of ownership; or where control is not retained.

Financial liabilities

Initial recognition and measurement

Financial liabilities are classified, at initial recognition, as financial liabilities at fair value through profit or loss, loans and borrowings, payables, or as derivatives designated as hedging instruments in an effective hedge, as appropriate.

All financial liabilities are recognised initially at fair value and, in the case of loans and borrowings and payables, net of directly attributable transaction costs.

The Group's financial liabilities include trade and other payables, loans and borrowings including bank overdrafts, and derivative financial instruments.

Subsequent measurement

For purposes of subsequent measurement, financial liabilities are classified in two categories:

► Financial liabilities at fair value through profit or loss
► Financial liabilities at amortised cost (loans and borrowings)

Financial liabilities at fair value through profit or loss

Financial liabilities at fair value through profit or loss include financial liabilities held for trading and financial liabilities designated upon initial recognition as at fair value through profit or loss.

Financial liabilities are classified as held for trading if they are incurred for the purpose of repurchasing in the near term. This category also includes derivative financial instruments entered into by the Group that are not designated as hedging instruments in hedge relationships as defined by NZ IFRS 9. Separated embedded derivatives are also classified as held for trading unless they are designated as effective hedging instruments.

Gains or losses on liabilities held for trading are recognised in the statement of profit or loss.

Financial liabilities designated upon initial recognition at fair value through profit or loss are designated at the initial date of recognition, and only if the criteria in NZ IFRS 9 are satisfied. The Group has not designated any financial liability as at fair value through profit or loss.

Financial liabilities at amortised costs (loans and borrowings)

This is the category most relevant to the Group. After initial recognition, interest-bearing loans and borrowings are subsequently measured at amortised cost using the EIR method. Gains and losses are recognised in profit or loss when the liabilities are derecognised as well as through the EIR amortisation process.

Amortised cost is calculated by taking into account any discount or premium on acquisition and fees or costs that are an integral part of the EIR. The EIR amortisation is included as finance costs in the statement of profit or loss.

This category generally applies to interest-bearing loans and borrowings.

Derecognition

A financial liability is derecognised when the obligation under the liability is discharged or cancelled or expires. When an existing financial liability is replaced by another from the same lender on substantially different terms, or the terms of an existing liability are substantially modified, such an exchange or modification is treated as the derecognition of the original liability and the recognition of a new liability. The difference in the respective carrying amounts is recognised in the statement of profit or loss.

Derivative financial instruments and hedge accounting

Initial recognition and subsequent measurement

The Group uses derivative financial instruments, such as forward currency contracts and interest rate swaps, to hedge its foreign currency risk and interest rate risk, respectively. Such derivative financial instruments are initially recognised at fair value on the date on which a derivative contract is entered into and are subsequently remeasured at fair value. Derivatives are carried as assets when the fair value is positive and as liabilities when the fair value is negative.

The fair value of electricity price commodity purchase contracts that meet the definition of a derivative as defined by NZ IFRS 9 is recognised in the statement of profit or loss as cost of sales. Electricity price swap contracts that are entered into and continue to be held for the purpose of the receipt or delivery of a non-financial item in accordance with the Group's expected purchase, sale or usage requirements are held at cost.

Any gains or losses arising from changes in fair value of derivatives are taken directly to the statement of profit or loss, except for the effective portion of cash flow hedges, which is recognised in other comprehensive income and later reclassified to profit or loss when the hedged item affects profit or loss.

For the purpose of hedge accounting, hedges are classified as:

• fair value hedges when hedging the exposure to changes in the fair value of a recognised asset or liability or an unrecognised firm commitment; or
• cash flow hedges when hedging the exposure to variability in cash flows that is either attributable to a particular risk associated with a recognised asset or liability or a highly probable forecast transaction, or a foreign currency risk in an unrecognised firm commitment; or
• hedges of a net investment in a foreign operation.

At the inception of a hedge relationship, the Group formally designates and documents the hedge relationship to which the Group wishes to apply hedge accounting, the risk management objective and its strategy for undertaking the hedge.

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Financial Instruments (continued)
The documentation includes identification of the hedging instrument, the hedged item, the nature of the risk being hedged and how the Group will assess whether the hedging relationship meets the hedge effectiveness requirements (including the analysis of sources of hedge ineffectiveness and how the hedge ratio is determined). A hedging relationship qualifies for hedge accounting if it meets all of the following effectiveness requirements:
• There is “an economic relationship” between the hedged item and the hedging instrument.
• The effect of credit risk does not “dominate the value changes” that result from that economic relationship.
• The hedge ratio of the hedging relationship is the same as that resulting from the quantity of the hedged item that the Group actually hedges and the quantity of the hedging instrument that the Group actually uses to hedge that quantity of hedged item.

Hedges which meet all the qualifying criteria for hedge accounting are accounted for as follows:

Cash flow hedges
The effective portion of the gain or loss on the hedging instrument is recognised directly in other comprehensive income in the cash flow hedge reserve, while any ineffective portion is recognised immediately in the statement of profit or loss. The cash flow hedge reserve is adjusted to the lower of the cumulative gain or loss on the hedging instrument and the cumulative change in fair value of the hedged item.

The amounts accumulated in other comprehensive income are accounted for, depending on the nature of the underlying hedged transaction. If the hedged transaction subsequently results in the recognition of a non-financial item, the amount accumulated in equity is removed from the separate component of equity and included in the initial cost or other carrying amount of the hedged asset or liability. This is not a reclassification adjustment and will not be recognised in other comprehensive income for the period. This also applies where the hedged forecast transaction of a non-financial asset or non-financial liability subsequently becomes a firm commitment to which fair value hedge accounting is applied.

For any other cash flow hedges, the amount accumulated in other comprehensive income is reclassified to the statement of profit or loss as a reclassification adjustment in the same period or periods during which the hedged cash flows affect the statement of profit or loss.

If cash flow hedge accounting is discontinued, the amount that has been accumulated in other comprehensive income must remain in accumulated other comprehensive income if the hedged future cash flows are still expected to occur. Otherwise, the amount will be immediately reclassified to the statement of profit or loss as a reclassification adjustment. After the discontinuation, once the hedged cash flow occurs, any amount remaining in accumulated other comprehensive income is accounted for depending on the nature of the underlying transaction as described above.

Fair value hedges
The change in the fair value of a hedging instrument is recognised in the statement of profit or loss as other expenses. The change in the fair value of the hedged item attributable to the risk hedged is recorded as a part of the carrying amount of the hedged item and is also recognised in the statement of profit or loss as other expenses.

For fair value hedges relating to items carried at amortised cost, the adjustment to carrying value is amortised through the statement of profit or loss over the remaining term of the hedge using the effective interest rate method. Effective interest rate amortisation may begin as soon as an adjustment exists and shall begin no later than when the hedged item ceases to be adjusted for changes in its fair value attributable to the risk being hedged. If the hedged item is derecognised, the unamortised fair value is recognised immediately in the statement of profit or loss.

When an unrecognised firm commitment is designated as a hedged item, the subsequent cumulative change in the fair value of the firm commitment attributable to the hedged risk is recognised as an asset or liability with a corresponding gain or loss recognised in the statement of profit or loss. The changes in the fair value of the hedging instrument are also recognised in the statement of profit or loss.

Current versus non-current classification
Derivative instruments that are not designated as effective hedging instruments are classified as current or non-current or separated into current and non-current portions based on an assessment of the facts and circumstances (i.e., the underlying contracted cash flows).

• Where the Group expects to hold a derivative as an economic hedge (and does not apply hedge accounting) for a period beyond 12 months after the end of the reporting period, the derivative is classified as non-current (or separated into current and non-current portions) consistently with the classification of the underlying item.
• Embedded derivatives that are not closely related to the host contract are classified consistently with the cash flows of the host contract.
• Derivative instruments that are designated as, and are effective hedging instruments, are classified consistently with the classification of the underlying hedged item. The derivative instruments are separated into current portions and non-current portions only if a reliable allocation can be made.

Provisions
A provision is recognised when the Company has a present legal or constructive obligation as a result of a past event, and it is probable that an outflow of economic benefits will be required to settle the obligation. If the effect is material, provisions are determined by discounting the expected future cash flows at a pre-tax rate that reflects current market rates and, where appropriate, the risks specific to the liability.

Issued Capital
Issued and paid up capital is recognised at the fair value of the consideration received by the Company. Any transaction costs incurred by the Company arising on the issue of capital are recognised directly in equity as a reduction of the share proceeds received.

Capital Management
The Company's capital is its shareholders equity which comprises of ordinary shares issued and paid up, retained earnings and reserves. Equity is represented by net assets. The Company manages its revenues, expenses, assets, liabilities, and general financial dealings prudently. The Company's equity is largely managed as a by-product of managing income, expenses, assets, liabilities, and compliance with budgeting processes and Board of Director instructions. The objective of managing the Company's equity is to ensure the Company effectively achieves it goals and objectives for which it has been established, whilst remaining a going concern.

Closure and Post Closure Costs
A provision for future landfill site restoration and aftercare costs is recognised when the activities giving rise to the need for site restoration and aftercare have commenced. The provision is stated at the present value of the future cash flows expected to be incurred, which increases each year due to the passage of time. Any increase in the provision due to the change in present value is recognised in the Statement of Profit or Loss as a time value adjustment.

Onerous Contracts
A provision for an onerous contract is recognised when the expected benefits to be derived by the Company from a contract are lower than the unavoidable cost of meeting its obligations under the contract.

Going Concern
No material uncertainties exist at or after balance date, that relate to events or conditions that may cast significant doubt on the Group or Company’s ability to continue as a going concern.

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Accounting Judgements, Estimates and Assumptions

The preparation of the Group's consolidated financial statements requires management to make judgement, estimates and assumption that affect the reported amounts of revenues, expenses, assets, liabilities, the accompanying disclosures and the disclosure of contingent liabilities. Uncertainty about these assumptions and estimates could result in outcomes that require a material adjustment to the carrying amount of the assets or liabilities in future periods.

Estimation uncertainty

The key assumptions concerning the future and other key sources of estimation uncertainty at the end of the reporting period, that have a significant risk of causing a material adjustment to the carrying amounts of assets and liabilities within the next financial year, are described below.

Impairment of non-current assets other than financial assets (other than goodwill)

The Group assesses whether there are any indicators of impairment for all non-financial and non-current assets at the end of each reporting period. Indefinite life intangible assets are tested for impairment annually and at other times when such an indicator exists. Other non-financial assets are tested for impairment when there are indicators that the carrying amounts may not be recoverable. An impairment exists when the carrying value of an asset or a cash-generating unit exceeds its recoverable amount, which is the higher of its fair value less costs of disposal and its value in use. The calculation of the fair value less costs of disposal is based on available data from binding sales transactions in an arm's length transaction of similar assets or observable market prices less incremental costs for disposing of the asset. When value in use calculations are undertaken, management must estimate the expected future cash flows from the asset or cash-generating unit and choose a suitable discount rate in order to calculate the present value of those cash flows.

Impairment of goodwill

The Group determines whether goodwill is impaired at least on an annual basis. This requires an estimation of the value in use of the cash-generating units to which the goodwill is allocated. Estimating the value in use requires the Group to make an estimate of the expected future cash flows from the cash-generating units and also to choose a suitable discount rate in order to calculate the present value of those cash flows. The carrying amount of goodwill at 31 December 2021 was $441.534 million (2020: $441.534 million). Further details are given in Note 8.

Impairment of trade receivables

The impairment provisions for trade receivables and other receivables are based on assumptions about expected credit losses. The Group uses judgements in making these assumptions and selecting the inputs to the impairment calculation, based on the number of days that an individual receivable is outstanding as well as the Group's historical experience and forward-looking information at the end of each reporting period. Changes in these assumptions and estimates could materially affect the results of the assessment and it may be necessary to make an additional impairment charge to profit or loss. Further details of the trade receivables and other receivables are given in note 15 to the financial statements.

Income tax

When providing for income tax, as a result of certain issues on income tax has yet to be confirmed by the tax authorities, estimation has to be made on the basis of the existing tax laws and regulations and other relevant policies. If the relevant matters of the final tax result is different from the estimation amount, the difference will affect the current income tax.

Estimated useful lives and residual value of fixed assets

When estimating useful lives and residual value of fixed assets, the following factors are considered: innovation and improvement, the products or services market demand related to asset changes which results in the outdated of the technical or commercial, intended use of the assets, physical abrasion, maintenance of assets, the laws about use of assets or similar restrictions. The estimate of useful lives of the relevant assets is based on the Group's experience of using similar assets in a similar condition. The estimated life of the landfill asset is dependent on both the resource consent period and estimated time to reach full capacity of the landfill. If the useful lives and residual value of fixed assets are inconsistent with previous estimates, the depreciation may need to be adjusted. The useful lives and residual value will be reviewed at each year end depending on the situation.

Provisions for site restoration

A provision for future landfill site restoration and aftercare costs is recognised when the activities giving rise to the need for site restoration and aftercare have commenced. Management estimates the present value of the future cash flows expected to be incurred, which increases each period due to the passage of time. Any increase in the provision due to the change in present value is recognised in the Statement of Profit or Loss as a time value adjustment. Management will re-evaluate the estimate at the end of each reporting period.

Future landfill site restoration and aftercare costs provided for are initially capitalised in the statement of financial position. Any change in the provision for future landfill site restoration and aftercare costs arising from a change in estimate of those costs is also recognised in non-current assets in the Statement of Financial Position.

Restoration provision are discounted to present value using a risk free rate published by the New Zealand Treasury Department. Future estimated costs are inflated by using a rate published by the New Zealand Treasury Department

Adjustments in fair value due to changes in estimated future cash flows or timing assumptions are recorded as a change in both the remediation asset and the liability at the time the change in estimate is made.

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2 REVENUE AND OTHER OPERATING INCOME

	2021 $000	2020 $000
Revenue represents the net sales from collections, landfill, recycling, technical services of waste management.		
An analysis of revenue, other income and gains is as follows:		
Collections	**349,298**	334,824
Landfill	**121,824**	97,771
Recycling	**23,171**	16,712
Technical Services	**54,747**	54,459
Others *	**(1,633)**	(308)
Total Revenue	**547,407**	503,458

* Others represents the cross stream internal revenue expense component that eliminates on consolidation against the revenue recognised in the source streams, due to the inclusion of the Joint Operation on a line by line basis.

Other income	**1,687**	345
Gain on sale of property, plant and equipment	**666**	184
Directors Fees	**100**	100
Management Fees	**15**	15
Dividend income	**4**	6
Net Foreign Exchange Gains/(Losses)	**251**	(394)
Government Subsidy	**40**	10,829
Total other income	**2,763**	11,085

Revenue from contracts with customers

Performance obligations

Information about the Group's performance obligations is summarised below:

Waste collection, landfill and technical services

The performance obligation is satisfied at the point in time when promised service is rendered to a customer, and payment in advance for waste collection is normally required and payment for landfill and technical services is generally due within 50 days as the term of agreements.

Recycling

The performance obligation is satisfied at the point in time when a promised good or service is transferred to a customer and payment is generally due within 50 days upon the transfer.

3 PROFIT BEFORE TAX

	2021 $000	2020 $000
Included within profit before tax are the following items:		
Loss/(Gain) on sale of property, plant and equipment	**(666)**	(184)
Donations	**26**	57
Impairment loss on trade receivables	**4,254**	1,409
Lease payments not included in the measurement of lease liabilities		
-short term lease payments	**3,112**	7,212
-payments for leases of low-value assets	**-**	-
-payments for variable lease payments	**403**	523

4 EMPLOYEE EXPENSES

	2021 $000	2020 $000
Wages and salaries	**116,318**	117,930
Other benefits	**7,171**	6,310
Total for year ended 31 December	**123,489**	124,240

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5 NET FINANCING EXPENSES

	NOTES	2021 $000	2020 $000
Interest income - other		**(49)**	**(42)**
Total interest income		**(49)**	(42)
Interest expense:			
- leases	26	**14,462**	12,381
- related parties	24	**70,409**	65,496
- other		**908**	899
Time value adjustment			
- Unwinding of provision	19	**120**	465
- Performance Bond Fee		**424**	407
Total interest expense		**86,323**	79,648
Total for year ended 31 December		**86,274**	79,606

6 TAXATION EXPENSE

	2021 $000	2020 $000
Income tax expense recognised in the Statement of Profit or Loss		Restated
Current tax expense	**162**	(5,294)
Deferred tax expense	**5,883**	9,878
Total income tax credit / (expense) in Statement of Profit or Loss	**6,045**	4,584
Reconciliation of effective tax rate		
Profit / (Loss) before tax	**(8,841)**	(6,425)
Income tax using the domestic corporation tax rate	**2,475**	1,799
Non-deductible expenses	**(1,512)**	633
Non-taxable income received from associates	**3,346**	2,484
Adjustment relating to prior period	**2,304**	(360)
Others	**(568)**	28
Total income tax credit / (expense) in Statement of Profit or Loss	**6,045**	4,584
Income Tax recognised directly in other comprehensive income		
Current Tax	**-**	-
Deferred Tax	**976**	270
Total Income tax recognised in other comprehensive income	**976**	270

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7 Property Plant and Equipment

	Land	Buildings and Site improvements	Vehicles and related equipment	Plant, machinery & containers	Leasehold	Capital WIP	Landfill development	Total
	$000	$000	$000	$000	$000	$000	$000	$000
Cost								
As at 1 January 2021	38,164	21,719	142,380	223,749	23,800	81,705	126,427	**657,944**
Transfers [1]	-	176	31,840	17,772	247	(60,143)	6,156	**(3,952)**
Landfill Provision Movement	-	-	-	-	-	-	(2,070)	**(2,070-)**
Additions	-	-	-	-	-	63,273	-	**63,273**
Disposal	(1,206)	(2,889)	(7,633)	(11,526)	(846)	-	-	**(24,100)**
Cost as at 31 December	**36,958**	**19,006**	**166,587**	**229,995**	**23,201**	**84,835**	**130,513**	**691,095**
Accumulated Depreciation								
As at 1 January 2021	-	(11,539)	(63,258)	(107,597)	(5,739)	-	(54,930)	**(243,063)**
Depreciation for the year	-	(2,018)	(17,554)	(23,931)	(1,222)	-	(11,184)	**(55,909)**
Disposals	-	2,754	7,246	10,177	842	-	-	**21,019**
Transfers [1]	-	-	-	(146)	-	-	-	**(146)**
Accumulated Depreciation as at 31 December	**-**	**(10,803)**	**(73,566)**	**(121,498)**	**(6,119)**	**-**	**(66,114)**	**(278,099)**
Net Book Value								
As at 31 December 2020	**38,164**	**10,180**	**79,122**	**116,152**	**18,061**	**81,705**	**71,497**	**414,881**
As at 31 December 2021	**36,958**	**8,203**	**93,021**	**108,498**	**17,082**	**84,835**	**64,399**	**412,996**

	Land	Buildings and Site improvements	Vehicles and related equipment	Plant, machinery & containers	Leasehold	Capital WIP	Landfill development	Total
	$000	$000	$000	$000 Restated	$000	$000 Restated	$000	$000
Cost								
As at 1 January 2020	38,164	21,321	129,979	197,171	14,501	80,535	113,769	**595,440**
Transfers [1]	-	403	16,538	31,911	9,351	(64,224)	5,828	**(193)**
Landfill Provision Movement	-	-	-	-	-	-	6,830	**6,830**
Additions	-	-	-	-	-	65,394	-	**65,394**
Disposal	-	(5)	(4,137)	(5,333)	(52)	-	-	**(9,527)**
Cost as at 31 December	**38,164**	**21,719**	**142,380**	**223,749**	**23,800**	**81,705**	**126,427**	**657,944**
Accumulated Depreciation								
As at 1 January 2020	-	(9,526)	(52,572)	(86,910)	(4,460)	-	(45,731)	**(199,199)**
Depreciation for the year	-	(2,018)	(14,776)	(24,768)	(1,331)	-	(9,199)	**(52,092)**
Disposals	-	5	4,090	4,471	52	-	-	**8,618**
Transfers [1]	-	-	-	(150)	-	-	-	**(150)**
Other	-	-	-	(240)	-	-	-	**(240)**
Accumulated Depreciation as at 31 December	**-**	**(11,539)**	**(63,258)**	**(107,597)**	**(5,739)**	**-**	**(54,930)**	**(243,063)**
Net Book Value								
As at 31 December 2019	**38,164**	**11,795**	**77,407**	**110,261**	**10,041**	**80,535**	**68,038**	**396,241**
As at 31 December 2020	**38,164**	**10,180**	**79,122**	**116,152**	**18,061**	**81,705**	**71,497**	**414,881**

(1) Net transfer out value of ($4,098) (2020: ($343)) represents Capital WIP acquired and build in the prior and current periods which on completion was recognised as intangibles.

This includes:

	NOTES	2021 $000	2020 $000
Software recognised as intangible assets	8	(4,098)	(372)
Build Operate Transfer recognised as intangible assets	8	-	29
Total Transfers		**(4,098)**	**(343)**

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8 INTANGIBLE ASSETS

	NOTES	2021 $000	2020 $000
Goodwill			
Opening Balance as at beginning of year		**441,534**	441,534
Goodwill balance as at 31 December		**441,534**	441,534
Other intangibles - customer contracts & consent costs			
Opening Balance as at beginning of year		**276,716**	287,492
Consent costs incurred		**-**	129
Amortisation of Customer Contracts		**(2,414)**	(2,414)
Amortisation of Resource Consents		**(6,641)**	(6,641)
Amortisation of Build Operate Transfer Facility		**-**	(1)
Amortisation of Software		**(2,281)**	(2,185)
Transfer of Software from CWIP	7	**4,098**	372
Build Operate Transfer recognised from property, plant and equipment	7	**-**	(29)
Disposal of Build Operate Transfer Facility		**-**	(7)
Other intangibles balance as at 31 December		**269,478**	276,716
Balance as at 31 December		**711,012**	718,250

Other intangible assets represent customer relationships and contracts recorded at their fair value on acquisition and are amortised over the term of the contracts.

Impairment tests for Intangible assets:
The Group is considered to be one cash generating unit.

This represents the lowest level within the Group at which the goodwill and other intangibles are monitored for internal management purposes.

Key assumptions used for value-in-use calculation:
The recoverable amount of the cash generating unit has been based on value in use calculations.

These calculations use cash flow projections based on actual operating results and financial budgets approved by management.
The cash generating unit's cash flows are forecast over 5 years using a nominal EBITDA average growth rate of 7.68% and a 2.50% terminal rate over perpetuity.
A discount rate of 3.98% has been used in discounting the projected cash flows.
These assumptions have been used for the analysis of the cash generating unit. Management determined the budgeted gross margin based on past performance and its' expectations for the market's development. The discount rates used reflect specific risks relating to the relevant cash generating unit.

9 INVESTMENT IN SUBSIDIARIES

Investment in subsidiaries
Beijing Capital Group NZ Investment Holding Limited's investment in subsidiaries comprises shares at cost. The significant subsidiaries comprise of:

		Interest held by Group 2021 %	2020 %
Investment in subsidiaries - companies incorporated in New Zealand	**Principal Activities**		
Waste Management NZ Limited	Waste Management Services	**100**	100
Tartan Industries Limited	Property Holding	**100**	100
Waste Care Limited	Name Protection	**100**	100
Waste Disposal Services Limited	Name Protection	**100**	100
Flexi-Bin Limited	Name Protection	**100**	100
Sunshine Garden Bag and Bin Company Limited	Name Protection	**100**	100
Budget Bins Ltd	Name Protection	**100**	100
Waste Management All Brite Limited	Name Protection	**100**	100
Gordies Bags Limited	Name Protection	**100**	100
Gordies Skip Bins Limted	Name Protection	**100**	100
Gordies Bins Limited	Name Protection	**100**	100
Healthcare Waste Limited	Name Protection	**100**	100
Living Earth Limited	Name Protection	**100**	100
Waste Management Limited	Name Protection	**100**	100
The Wheelibin Company Limited	Name Protection	**100**	100
Get-A-Bin Limited	Name Protection	**100**	100
Eastern Bins Limited	Name Protection	**100**	100
Waste Management Collections Limited	Name Protection	**100**	100
BCG Waste Management Limited	Name Protection	**100**	100
Canterbury Waste Services Limited	Name Protection	**100**	100
Recycle New Zealand Limited	Name Protection	**100**	100
Otago Waste Services Limited	Name Protection	**100**	100
Pacific Rubber Recycling Limited	Name Protection	**100**	100
ERS New Zealand Limited	Name Protection	**100**	100
Canterbury Material Recovery Facilities Limited	Name Protection	**100**	100
Waste Management Solutions (NZ) Limited	Name Protection	**100**	100
Waste Services Marlborough Limited	Name Protection	**100**	100
Waste Management Technical Services Limited	Name Protection	**100**	100
Waste Management Recycling Limited	Name Protection	**100**	100

(i) All subsidiaries are New Zealand entities that are direct subsidiaries of the Company and have a 31 December balance date. There are no significant restrictions on the ability of the subsidiary to pay dividends, repay loans or otherwise transfer funds to the Parent.

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10 INVESTMENT IN ASSOCIATES

a) Movements in the carrying amount of the Group's investment in associates

	2021 $000	2020 $000
Balance as at beginning of year	**96,350**	96,134
Dividends received	**(15,200)**	(8,650)
Share of profit/(loss)	**12,746**	9,708
Amortisation of identified intangible consent costs	**(795)**	(841)
Balance as at 31 December	**93,101**	96,351

b) Investment details

Summary financial information on associates - For the 50% ownership share

Name	Country of Incorporation	Nature of Business	Assets $000	Liabilities $000	Revenue $000	Profit / (Loss) $000	% Interest Held
2021							
Midwest Disposals Limited	New Zealand	Landfill Operation & Refuse Transfer Station	**28,871**	**14,669**	**12,700**	**4,835**	50
Pikes Point Transfer Station Limited	New Zealand	Refuse Transfer Station	**3,096**	**643**	**3,785**	**284**	50
Transwaste Canterbury Limited	New Zealand	Landfill Operation	**51,506**	**18,831**	**22,836**	**6,745**	50
Daniels Sharpsmart New Zealand Limited	New Zealand	Supply & Cleaning of Reusable Sharps Containers	**960**	**507**	**1,050**	**87**	50
Total			**84,433**	**34,650**	**40,371**	**11,951**	
2020							
Midwest Disposals Limited	New Zealand	Landfill Operation & Refuse Transfer Station	20,055	7,190	10,684	3,431	50
Pikes Point Transfer Station Limited	New Zealand	Refuse Transfer Station	2,953	784	3,497	195	50
Transwaste Canterbury Limited	New Zealand	Landfill	59,542	21,914	21,495	5,234	50
Daniels Sharpsmart New Zealand Limited	New Zealand	Supply & Cleaning of Reusable Sharps Containers	819	452	902	7	50
Total			83,369	30,340	36,578	8,867	

All Joint Venture Companies are measured using the equity method of accounting

11 INVESTMENT IN JOINT OPERATIONS

The Group has a 50% interest in Waste Disposal Services, an unincorporated joint venture with Auckland Council Property Limited. Waste Disposal Services operates a landfill and refuse station in South Auckland. Audit New Zealand perform the audit of Waste Disposal Services each year. Waste Disposal Services balance date is 30 June. The following share of material assets and liabilities of Waste Disposal Services have been included in the Financial Statements:

	2021 $000	2020 $000
Assets		
Current assets	**5,004**	5,432
Non current assets	**22,463**	20,247
	27,467	25,679
Liabilities		
Current liabilities	**1,789**	1,252
Non current liabilities	**7,688**	8,507
	9,477	9,759
Net assets	**17,990**	15,920
Share of revenues	**15,535**	10,472
Share of expenses	**(8,171)**	(5,889)
Share of operating surplus before taxation	**7,364**	4,583
Share of the joint operation's other comprehensive income	**1,207**	(276)
Cash Received	**(6,500)**	(1,500)

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12 DEFERRED TAXATION

Deferred tax relates to the following assets and liabilities	Consolidated Statement of Financial Position		Consolidated Statement of Profit or Loss	
	2021	2020	**2021**	2020
	$000	$000	**$000**	$000
		Restated		Restated
Investment in associate companies				
Property, plant and equipment	**(23,489)**	(24,313)	**824**	(230)
Trade and other receivables	**498**	588	**(89)**	(42)
Intangibles	**(70,661)**	(73,194)	**2,532**	1,781
Provisions	**18,441**	19,215	**(774)**	2,153
Employee benefits	**3,774**	3,706	**68**	1,575
Derivative financial instruments	**43**	1,412	**(393)**	-
Right of use assets	**(80,120)**	(77,480)	**(2,640)**	(4,469)
Lease liabilities	**85,837**	80,810	**5,029**	7,333
Other	**(1,108)**	(2,436)	**1,326**	1,777
Tax assets / (liabilities)	**(66,785)**	(71,692)	**5,883**	9,878

	Consolidated Statement of Comprehensive Income		Balances Acquired	
	2021	2020	**2021**	2020
	$000	$000	**$000**	$000
Derivative financial instruments	**(976)**	(270)	**-**	-
Tax assets / (liabilities)	**(976)**	(270)	**-**	-

Reflected in the statement of Financial Position as follows:		
Deferred tax assets - Continuing Operations	**22,756**	24,921
Deferred tax liabilities - Continuing Operations	**(89,541)**	(96,613)
Deferred Net Tax Liability	**(66,785)**	(71,692)

13 BANK AND BANK OVERDRAFT (Unsecured)

	2021	**2020**
	$000	**$000**
Cash at bank and in hand	**28,354**	26,021
Balance as at 31 December	**28,354**	26,021

The Group's overdraft facility is $5 million with ANZ and the interest costs at a rate of the reference rate plus a margin of 2.00% per annum.

14 TRADE AND OTHER RECEIVABLES

	NOTES	**2021**	**2020**
		$000	**$000**
Current receivables			
Trade receivables			
- related parties	24	**2,973**	3,158
- non related parties		**52,775**	55,165
		55,748	58,323
Other receivables		**150**	2,724
Balance as at 31 December		**55,898**	61,047

The Group applies the simplified approach to provide for expected credit losses, which permits the use of the lifetime expected loss for all trade receivables. To measure the expected credit losses, trade receivables have been grouped based on shared credit risk characteristics and the days past due. The expected credit losses have also incorporated forward looking information.

15 PROPERTY HELD FOR RESALE

	2021	**2020**
	$000	**$000**
Vehicles	**2,073**	827
Containers	**1**	4
Land	**739**	-
Balance as at 31 December	**2,813**	831

Assets held for sale consist of the following:
- Assets that are built for owner drivers on behalf of Waste Management NZ and are expected to be sold within a year.
- Containers purchased by Waste Management NZ specifically for resale to councils that are expected to be sold within a year.
- Property being subdivided that is expected to be sold within a year.

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16 SHAREHOLDER'S EQUITY

	Number 2021	Number 2020	Value 2021 $000	Value 2020 $000
Shares issued and fully paid up				
209,987,539 ordinary shares @ $1 each	**209,987,540**	209,987,540	**209,988**	209,988
Balance as at 31 December	**209,987,540**	209,987,540	**209,988**	209,988

Retained Earnings		2021 $000	2020 $000 Restated
Balance as at beginning of year		**87,342**	84,594
Net surplus/ (deficit) for the year		**(2,795)**	(1,841)
Transfer from capital notes reserve	17	**3,409**	4,589
Balance as at 31 December		**87,956**	87,342

17 RESERVES

		2021 $000	2020 $000
Hedging reserve			
Balance as at beginning of year		**(3,595)**	(4,324)
Total recognised income and expenses		**3,486**	729
Balance as at 31 December		**(109)**	(3,595)

The hedging reserve comprises the effective portion of the cumulative net change in the fair value of cash flow hedging instruments related to hedged transactions that have not yet impacted on Statement of Profit or Loss.

Capital note reserve			
Balance as at beginning of year		**6,262**	10,851
Total recognised income and expenses	16	**(3,409)**	(4,589)
Balance as at 31 December		**2,853**	6,262

The capital note reserve comprises the equity component of the $150,000,000 of capital notes issued on 27 June 2014 to BCG NZ Investment Holding Limited. The capital notes have been split into debt and equity components based on the net present value of the expected interest free notes over their life using a rate of 8.80% per annum. Initially the reserve recognised on borrowings was $44,928,762 which includes recognition of a deferred tax liability on the balance with an equity component on the capital notes of $62,401,058 offset by a deferred tax liability of $17,472,296.

Balance as at 31 December		**2,744**	2,667

18 INTEREST-BEARING LOANS AND BORROWINGS

	NOTES	2021 $000	2020 $000
Non-current liabilities			
Loans from related parties	24	**140,231**	130,098
		140,231	130,098
Current liabilities			
Loans from related parties	24	**640,600**	634,853
Interest bearing loans and borrowings		**20,000**	30,000
		660,600	664,853
Total Liabilities		**800,831**	794,951

Interest bearing loans and borrowings

The Group has a revolving credit facility agreement with the ANZ Bank New Zealand Limited, with a limit of $140,000,000 that has a final expiry date of 31 July 2023.
The current drawn down portions of the available tranche's under the facility are:
- The revolving credit facility NZ$15,200,000 from ANZ Bank New Zealand Limited bears annual interest rate around 1.6041% with a repayment date of 05 January 2022.
- The revolving credit facility NZ$2,200,000 from ANZ Bank New Zealand Limited bears annual interest rate around 1.6041% with a repayment date of 05 January 2022.
- The revolving credit facility NZ$2,600,000 from ANZ Bank New Zealand Limited bears annual interest rate around 1.6041% with a repayment date of 05 January 2022.

Loans from related parties

The Company has a loan facility by way of an agreement dated 18 June 2014 for the ability to draw down funds as required from BCG NZ Investment Holding Limited to a limit of $700,000,000.
This facility expires on 30 June 2024.
The current drawn down portions under the facility are:
1 - An unsecured term loan of $450,000,000 with an interest rate of 4.76% plus a margin, with a repayment date of 31 December 2021.
2 - An unsecured working capital facility of $100,000,000 subject to the interest rate of the term loan, with a repayment date of 31 December 2021.
3 - An unsecured subordinated loan of $150,000,000 with an interest rate of 9.36%, with a repayment date of 31 December 2021.

The current APA expired 31 December 2021, the Group is currently in the process of accessing the options to replace this loan agreement. The underlying facility terms and conditions will be revised as part of the process and agreed between the lender and borrower as part of any agreement that maybe signed off with the Inland Revenue.

As a result, the current carrying value of the drawn down components are recognised as current liabilities and repayable on demand. The balance is derived from the following:

As at 31 December 2021 Beijing Capital Group NZ Investment Holding Limited has drawn down the term loan and subordinated loan totalling $600,000,000 (2020: $600,000,000). Subsequent to the initial draw down, principal of ($78,000,000) has been repaid while $118,599,984 of interest has been capitalised leaving a balance owing of $640,599,984 (2020: $634,852,691).

In addition, Beijing Capital Group Investment Holding Limited has by way of an agreement dated 18 June 2014 issued Capital Notes to BCG NZ Investment Holding Limited on 27 June 2014 to the value of $150,000,000. The final redemption date for these Notes is 30 June 2024.

The capital notes have been split into debt and equity components based on the net present value of the expected cash flows over their life using a rate of 8.80% per annum at the time of recognition. The equity component as at 27 June 2014 was determined to be $62,401,058, with the remaining balance of the $150,000,000 representing the debt component.

A further $923,274 was recognised in the debt to the interest expense during the year ended 31 December 2021 under the revalued net present value of the expected cash flows over their life.

As at 31 December 2021 the debt component balance of the capital notes was $140,231,183 (2020 $130,097,595). The notes are convertible at the election of the parent based on certain criteria being met. The estimation of the debt and equity component necessarily involves assumptions about when the parent will elect to convert the notes.

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19 PROVISIONS

Closure and post-closure provisions

Provision is made for the future costs of closing the Group's landfills at the end of their economic or consented lives and for the associated post-closure costs, being the aftercare of the landfills for the prescribed periods. Estimated costs, adjusted for inflation, are built up on an item by item basis. The provision held at each balance date, represents the net present value of the estimated future costs. A detailed reassessment of these costs and the anticipated remaining lives of the landfills is performed regularly.

The impact of changes to the provision arising from the reassessment of the lives of the landfills and estimated future costs are capitalised to deferred closure and post-closure costs within property, plant and equipment in the statement of Financial Position. The annual change in the net present value of the provision due to the passage of time is recorded as the time value adjustment of provisions in the Statement of Comprehensive Income. The financial reporting standards require this to be disclosed as an interest cost in the Statement of Comprehensive Income.

	2021 $000	2020 $000
Balance as at beginning of year	**54,187**	47,599
Reassessment of closure and post-closure provision	**(2,069)**	6,830
Effect of time value adjustment	**120**	465
Provision utilised	**(1,757)**	(707)
Balance as at 31 December	**50,481**	54,187

20 TRADE AND OTHER PAYABLES

	NOTES	2021 $000	2020 $000
Current creditors			
Trade creditors			
- related parties	24	**753**	1,012
- non related parties		**20,653**	25,029
Goods and Services Tax payable		**4,451**	4,621
Other creditors, accruals and provisions		**44,363**	30,927
Balance as at 31 December		**70,220**	61,589

21 OPERATING LEASES

The Group leases its equipment under operating lease arrangements, with leases negotiated for terms of one to two years.
At 31 December 2021, the Group had total future minimum lease receivables under non-cancellable operating leases with its tenants falling due as follows:

	2021 $000	2020 $000
Not later than one year	**363**	418
Later than one year and not later than five years	**122**	290
Total as at 31 December	**485**	708

During the year, no contingent rentals receivable was recognised by the Group (2020: Nil).

22 CAPITAL COMMITMENTS

	2021 $000	2020 $000
Contracted capital expenditure at 31 December	**23,250**	14,905
Total as at 31 December	**23,250**	14,905

23 CONTINGENCIES

	2021 $000	2020 $000
Obligations arising from performance bonds and guarantees given in respect of:		
Redvale Landfill	**29,351**	29,662
Tirohia Landfill	**5,485**	5,485
Whitford Landfill	**8,335**	7,994
Kate Valley Landfill	**7,900**	7,900
Bonny Glenn Landfill	**2,673**	2,673
Local authority waste collection contracts and other activities	**25,442**	26,599
Total as at 31 December	**79,186**	80,313

Contingencies include the Group's share of associate companies contingencies.
The directors are of the opinion that none of these obligations will eventuate.

At balance date, the Taxation Authority in New Zealand continues its reviews of the Group's tax position. The reviews are ongoing and at this time it is too early to identify the adjustments that may arise, if any.

The Ministry for Business and Innovation have identified irregularities with Waste Management's compliance with the Holiday Pay Act 2003. At year end, progress has been made with the consultants engaged to assess the impact of the non-compliance to remediate for the irregularities. Relevant provisions have been made based on these assessments as at 31 December 2021.

There are no other known contingent liabilities in existence subsequent to balance date.

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24 RELATED PARTY DISCLOSURES

Identity of related parties
The immediate parent of the Group is BCG NZ Investment Holding Limited based in Hong Kong. The Group has a related party relationship with its subsidiaries (see Note 9), associates (see Note 10), joint venture (see Note 11) and with its Directors and Executive Officers. The ultimate parent of the Group is Beijing Capital Group Co., Limited which is ultimately controlled by the State-owned Assets Supervision and Administration Commission of the Chinese Government.

The following trade receivables were owed to the Group by related parties at balance date:	**NOTES**	**2021 $000**	**2020 $000**
Waste Disposal Services [1]		**116**	102
Pikes Point Transfer Station Limited [2]		**159**	158
Midwest Disposal Limited [3]		**131**	20
Transwaste Canterbury Limited [4]		**2,567**	2,878
	14	**2,973**	3,158
The following revenue was earned from related parties during the year:			
Waste Disposal Services [1]		**988**	949
Pikes Point Transfer Station Limited [2]		**2,485**	2,333
Midwest Disposal Limited [3]		**1,461**	1,322
Transwaste Canterbury Limited [4]		**25,545**	26,481
Burwood Resource Recovery Park Limited [5]		**1,321**	1,993
		31,800	33,078
The following trade payables were owed by the Group to related parties at balance date:			
Waste Disposal Services [1]		**(649)**	(992)
Pikes Point Transfer Station Limited [2]		**-**	(20)
Midwest Disposal Limited [3]		**(104)**	-
	20	**(753)**	(1,012)
The following charges from related parties were incurred during the year:			
Waste Disposal Services [1]		**(4,596)**	(3,731)
Pikes Point Transfer Station Limited [2]		**(3,264)**	(2,912)
Midwest Disposal Limited [3]		**(7,887)**	(8,013)
Transwaste Canterbury Limited [4]		**(7,263)**	(8,408)
Burwood Resource Recovery Park Limited [5]		**-**	-
Daniels Sharpsmart New Zealand Limited [7]		**(1,161)**	(867)
		(24,171)	(23,931)
Current Loans from related parties:			
BCG NZ Investment Holding Limited		**8,381**	(2,167)
BCG NZ Investment Holding Limited - Interest Bearing	18	**(640,600)**	(634,853)
		(632,219)	(637,020)
Non Current Loans from related parties:			
BCG NZ Investment Holding Limited - Capital Notes	18	**(140,231)**	(130,098)
		(140,231)	(130,098)
The following interest was charged by related parties during the financial year:			
BCG NZ Investment Holding Limited	5	**(70,409)**	(65,496)
		(70,409)	(65,496)
Key Management Personnel:			
Total compensation paid to key management personnel	-	**815**	1,207
		815	1,207

[1] Waste Disposal Services is an unincorporated joint venture with Auckland Council Property Ltd
[2] Pikes Point Transfer Station Ltd is 50% owned with Envirocare Ltd
[3] Midwest Disposal Ltd is 50% owned with Enviro Waste Services Ltd
[4] Transwaste Canterbury Ltd is 50% owned with 5 other territorial local authorities(amalgamated during 2020.)
[5] Burwood Resource Recovery Park Ltd is 100% owned by Transwaste Canterbury Ltd
[6] Tiromoana Station Ltd is 100% owned by Transwaste Canterbury Ltd (Amalgamated during 2020)
7 Daniels Sharpsmart New Zealand Ltd is 50% owed with SteriHealth Pty Ltd

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25 FINANCIAL INSTRUMENTS

		2021 $000	2020 $000
Fair Value of hedging instruments held:			
Forward commodity contracts	Non-current	-	(133)
	Current	(152)	(5,255)
Balance as at 31 December		**(152)**	(5,388)

Derivative financial instruments are used by the Group in the normal course of business in order to hedge exposure to fluctuations in foreign currency rates and movements in electricity prices.

Electricity price swaps are designated as hedging instruments in cash flow hedges of forecast sales in electricity price.
These forecast transactions are highly probable, and the swaps are being used to hedge the electricity price exposure of fixed price range from $70 to $80 with notional amount of $397,000.

There is an economic relationship between the hedged item and the hedging instrument as the terms of the swaps match the terms of the expected highly probable forecast transactions.
The Group established a hedge ratio of the hedging relationship is the same as the resulting from the quantity of the hedged item.
To measure the hedge effectiveness, the Group compares the changes in the fair value of the hedging instruments against the changes in fair value of the hedged items attributable to the hedged risks.

Hedging ineffectiveness can arise from:
Changes to the forecasted amounts of cash flows of hedged items and hedging instruments

26 LEASES

The Group as a lessee
The Group has lease contracts for various items of land and buildings, plant and machinery and motor vehicles used in its operations. Leases of land and buildings and plant and machinery generally have lease terms between 1 and 52 years while motor vehicles generally have lease terms between 1 and 5 years. Generally, the Group is restricted from assigning and subleasing the leased assets outside the Group.

(a) Right-of-use assets
The carrying amounts of the Group's right-of-use assets and the movements during the year are as follows:

	Land and buildings NZ$	Plant and machinery NZ$	Motor vehicles NZ$	Total NZ$
As at 1 January 2021	275,236	131	3,038	**278,405**
Additions	73,865	-	1,372	**75,237**
Depreciation charge	(11,566)	(44)	(1,469)	**(13,079)**
Reassessment of a lease term arising from a decision not to exercise the extension option	(57,608)	-	-	**(57,608)**
Revision of a lease term arising from a change in the non-cancellable period of a lease	4,879	-	-	**4,879**
As at 31 December 2021	**284,806**	**86**	**2,941**	287,834
As at 1 January 2020	259,032	180	3,487	**262,699**
Additions	25,179	-	1,017	**26,196**
Depreciation charge	(7,845)	(49)	(1,466)	**(9,360)**
Revision of a lease term arising from a change in the non-cancellable period of a lease	(1,130)	-	-	**(1,130)**
As at 31 December 2020	**275,236**	**131**	**3,038**	278,405

Included in land and buildings is a property lease for a site located in Auckland, New Zealand. The property is occupied by Waste Management NZ Limited and serves as its national head office. The property is purpose-built in order to facilitate the long-term needs of the business. The lease agreement has an initial, non-cancellable lease period of 25 years which commenced on 22 December 2019. Subsequently, the lease agreement includes one right of renewal of ten years followed by seven rights of renewals of eight years each. The final expiry date is 21 December 2110.

During 2021 a reassessment of the lease term occurred reducing the number of renews included to two rights of renewal of eight years, from the orginal seven rights of renewal.

(b) Lease liabilities
The carrying amount of lease liabilities and the movements during the year are as follows:

	2021 $000	2020 $000
Carrying amount at 1 January 2021	288,606	262,418
New leases	75,237	26,449
Reassessment of a lease term arising from a decision not to exercise the extension option	(57,608)	-
Revision of a lease term arising from a change in the non-cancellable period of a lease	4,879	-
Interest expense	14,462	12,381
Payments:		
- Principle portion of Lease	(6,593)	(5,715)
- Interest paid	(12,420)	(5,762)
Others	-	(1,165)
Carrying amount at 31 December 2021	**306,563**	**288,606**
Analysed into:		
Current portion	17,336	11,585
Non-current portion	289,227	277,021
	306,563	**288,606**

The Group had total cash outflows for leases of $22,528,000 (2020: $19,212,000)

27 SUBSEQUENT EVENTS

On 3 April 2022 Beijing Capital Group Co., Ltd announced the conditional sale of Beijing Capital Group NZ Investment Holding Limited to First Sentier Investors Group. The conditional sale was dated 31 March 2022 for an initial purchase price determined based on an enterprise value of $1.9b. Completion of the sale is conditional upon fulfilment of
a. consent under the Overseas Investment Act 2005 and the Overseas Investment Regulations 2005; and
b. shareholders' approvals on the Disposal of both Beijing Capital Eco-Environment Protection Group Co., Ltd and the Company being obtained.

The sale has been determined to be a non adjusting subsequent event.

There were no other material events subsequent to balance date that would affect the interpretation of the Financial Statements or the financial performance of Beijing Capital Group NZ Investment Holding Limited and its subsidiaries as at 31 December 2021 (2020: Nil).

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28 RESTATEMENT OF PRIOR YEAR

In April 2021, IFRIC issued an agenda decision clarifying its interpretation on how current accounting standards apply to configuration and customisation costs incurred in implementing Software-as-a-Service ('SaaS') cloud computing arrangements. The IFRIC decision has clarified that because SaaS arrangements are service contracts that provide the Group with the right to access the cloud provider's application software over the contract period, costs to configure or customise this software should be recognised as operating expenses when the services are received.

The Group's previous accounting policy was to record these configuration and customisation costs as part of the asset costs and amortise these costs over the useful life of the assets. The Group has completed a review process and has adjusted the impact of this agenda decision on its financial statements. As a result comparative information as at 31 December 2020 has been restated as follows for all effected items:

	Reported 2020 $000	Adjustments 2020 $000	Restated 2020 $000
Revenue	503,458		**503,458**
	-		
Other operating income	11,085		**11,085**
Subcontractor expenses	(61,504)		**(61,504)**
Disposal expenses	(75,938)		**(75,938)**
Employee expenses	(124,240)		**(124,240)**
Vehicle, plant and machinery operating expenses	(44,296)		**(44,296)**
Other operating expenses	(54,694)		**(54,694)**
Selling & administration expenses	(13,483)	(3,141)	**(16,624)**
Operating profit before financing, impairment, depreciation, associates and tax	**140,388**	**(3,141)**	**137,247**
Depreciation expense	(62,395)	943	**(61,452)**
Amortisation expense	(11,241)		**(11,241)**
Impairment expense on intangibles	(240)		**(240)**
Operating profit / (loss) before financing, associates and tax	**66,512**	**(2,198)**	**64,314**
Net financing expenses	(79,606)		**(79,606)**
Share of profit of associates	8,867		**8,867**
Profit / (Loss) before tax	**(4,227)**	**(2,198)**	**(6,425)**
Income tax credit / (expense)	3,969	615	**4,584**
Net profit / (loss) for the year	**(258)**	**(1,583)**	**(1,841)**
Profit for the year	**(258)**	**(1,583)**	**(1,841)**
Other comprehensive income			
Revaluation of hedge contracts	729		**729**
Other comprehensive income for the year	**729**	**-**	**729**
Total comprehensive income for the year	**471**	**(1,583)**	**(1,112)**

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28 RESTATEMENT OF PRIOR YEAR (continued)

	Reported 2020 $000	Adjustments 2020 $000	Restated 2020 $000
ASSETS			
Non current assets			
Investment in subsidiaries	96,351		**96,351**
Property, plant and equipment	419,100	(4,219)	**414,881**
Right of use assets	278,405		**278,405**
Intangible assets	718,250		**718,250**
Emission units	9,081		**9,081**
	1,521,187	**(4,219)**	**1,516,968**
Current assets			
Cash and cash equivalents	26,021		**26,021**
Trade and other receivables	61,047		**61,047**
Prepayments	4,124		**4,124**
Inventory	2,560		**2,560**
Property held for resale	831		**831**
	94,583	**-**	**94,583**
TOTAL ASSETS	**1,615,770**	**(4,219)**	**1,611,551**
EQUITY			
Share capital	209,988		**209,988**
Reserves	2,667		**2,667**
Retained earnings	90,380	(3,038)	**87,342**
TOTAL EQUITY	**303,035**	**(3,038)**	**299,997**
LIABILITIES			
Non current liabilities			
Closure and post closure provisions	54,187		**54,187**
Lease liabilities	277,021		**277,021**
Derivative financial instruments - financial assets	133		**133**
Deferred taxation	72,873	(1,181)	**71,692**
Loans from related parties	130,098		**130,098**
	534,312	**(1,181)**	**533,131**
Current liabilities			
Interest bearing loans and borrowings	30,000		**30,000**
Loans from related parties	637,020		**637,020**
Trade and other payables	59,083		**59,083**
Provisions	18,633		**18,633**
Provision for taxation	244		**244**
Revenue received in advance	16,603		**16,603**
Lease liabilities	11,585		**11,585**
Derivative financial instruments - financial liabilities	5,255		**5,255**
	778,423	**-**	**778,423**
TOTAL LIABILITIES	**1,312,735**	**(1,181)**	**1,311,554**
TOTAL EQUITY AND LIABILITIES	**1,615,770**	**(4,219)**	**1,611,551**

Adjustments as at 1 January 2020 (opening balance of comparative period)
At the commencement of the comparative period, 1 January 2020, the Group had a capitalised value of cost incurred to implement, customise or configure SaaS arrangements of $2,705,000. As a result of the change in accounting policy, the written down value of these assets has been expensed, with the impact recorded to opening accumulated losses.

The change in accounting policy has had the following impact on the financial position as at 31 December 2019:
- a decrease in Property, plant and equipment of $2,021,000;
- an increase in deferred tax assets of $566,000;
- a decrease in opening retained earnings of $1,455,000;

Adjustments to comparative information
For the comparative period to 31 December 2020, the Group capitalised costs to implement, customise or configure SAAS arrangements of $3,141,000, the Group also recorded $943,000 of depreciation and amortisation on previously capitalised SAAS costs. The impact on the financial statements is reflected in the tables above.

Impact on current period For the current period to 31 December 2021
For the current period to 31 December 2021, the Group capitalised costs to implement, customise or configure SAAS arrangements of $1,340,000, the Group also recorded $1,328,000 of depreciation and amortisation on previously capitalised SAAS costs. The change in accounting policy has had the following impact on the financial statements for the year ended 31 December 2021, after the restatement of prior periods:

- a decrease in Property, plant and equipment of $4,321,000;
- an increase in deferred tax assets of $1,185,000;
- an increase in operating expenses of $1,340,000;
- a decrease in depreciation expense of $1,328,000;
- an increase in cash outflows from operating activities of $1,340,000, and an offsetting decrease in cash outflows from investing activities;
- a decrease in tax expense of $3,000;
- a decrease in profit before tax of $12,000;

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Building a better working world

Independent auditor's report to the Shareholder of Beijing Capital Group NZ Investment Holding Limited
Report on the audit of the financial statements

Opinion

We have audited the financial statements of Beijing Capital Group NZ Investment Holding Limited ("the Company") and its subsidiaries (together "the Group"), which comprise the consolidated statement of financial position of the Group as at 31 December 2021, the consolidated statement of profit or loss and other comprehensive income, consolidated statement of changes in equity and consolidated statement of cash flows for the year then ended of the Group, and the notes to the consolidated financial statements including a summary of significant accounting policies.

In our opinion, the consolidated financial statements present fairly, in all material respects, the consolidated financial position of the Group as at 31 December 2021 and its consolidated financial performance and cash flows for the year then ended in accordance with New Zealand equivalents to International Financial Reporting Standards Reduced Disclosure Regime.

This report is made solely to the Company's shareholder. Our audit has been undertaken so that we might state to the Company's shareholder those matters we are required to state to them in an auditor's report and for no other purpose. To the fullest extent permitted by law, we do not accept or assume responsibility to anyone other than the Company and the Company's shareholder, for our audit work, for this report, or for the opinions we have formed.

Basis for opinion

We conducted our audit in accordance with International Standards on Auditing (New Zealand). Our responsibilities under those standards are further described in the *Auditor's Responsibilities for the Audit of the Financial Statements* section of our report.

We are independent of the Group in accordance with Professional and Ethical Standard 1 (revised) Code of Ethics for Assurance Practitioners issued by the New Zealand Auditing and Assurance Standards Board, and we have fulfilled our other ethical responsibilities in accordance with these requirements.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our opinion.

Ernst & Young provides taxation compliance services, taxation advisory services and transaction advisory services to the Group. Partners and employees of our firm may deal with the Group on normal terms within the ordinary course of trading activities of the business of the Group. We have no other relationship with, or interest in, the Group.

Information other than the financial statements and auditor's report

The directors of the Company are responsible for the Annual Report, which includes information other than the consolidated financial statements and auditor's report.

Our opinion on the consolidated financial statements does not cover the other information and we do not express any form of assurance conclusion thereon.

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In connection with our audit of the consolidated financial statements, our responsibility is to read the other information and, in doing so, consider whether the other information is materially inconsistent with the consolidated financial statements or our knowledge obtained during the audit, or otherwise appears to be materially misstated.

Directors' responsibilities for the financial statements

The directors are responsible, on behalf of the Company, for the preparation and fair presentation of the consolidated financial statements in accordance with New Zealand equivalents to International Financial Reporting Standards Reduced Disclosure Regime, and for such internal control as the directors determine is necessary to enable the preparation of consolidated financial statements that are free from material misstatement, whether due to fraud or error.

In preparing the consolidated financial statements, the directors are responsible for assessing on behalf of the entity the Group's ability to continue as a going concern, disclosing, as applicable, matters related to going concern and using the going concern basis of accounting unless the directors either intend to liquidate the Group or cease operations, or have no realistic alternative but to do so.

Auditor's responsibilities for the audit of the financial statements

Our objectives are to obtain reasonable assurance about whether the consolidated financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes our opinion. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with International Standards on Auditing (New Zealand) will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of these consolidated financial statements.

A further description of our responsibilities for the audit of the consolidated financial statements is located at the External Reporting Board website: https://www.xrb.govt.nz/standards-for-assurance-practitioners/auditors-responsibilities/audit-report-7. This description forms part of our auditor's report.

Ernst + Young

Chartered Accountants
Auckland
7 April 2022

RELEASED UNDER THE LOCAL GOVERNMENT AND MEETINGS ACT 1987

BEIJING CAPITAL GROUP NZ INVESTMENT HOLDING LIMITED
AND SUBSIDIARIES

ANNUAL REPORT AND FINANCIAL STATEMENTS

FOR THE YEAR ENDED 31 DECEMBER 2020

RELEASED UNDER THE LOCAL GOVERNMENT AND MEETINGS ACT 1987

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COMPANY DIRECTORY

Nature of Business	Company: Group:	Holding Company Waste Management Services
Company Number NZ Busines Number	5102401 9429041180495	
Registered Office	318 East Tamaki Road East Tamaki Auckland	
Directors	s7(2)(a)	(Resigned 11 March 2020) (Resigned 30 April 2020) (Resigned 31 December 2020) (Appointed 31 December 2020) (Appointed 30 April 2020) (Appointed 06 April 2020)
Shareholder	BCG NZ Investment Holding Limited	209,987,540 Shares
Auditor	Ernst & Young PO Box 2146 Auckland 1140	
Banker	ANZ Bank Bank of New Zealand HSBC Bank	
Solicitors	Brown Partners Lawyers Russell McVeagh	
Business Location	East Tamaki Auckland	

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ANNUAL REPORT
For the year ended 31 December 2020

The Board of Directors present their Annual Report including Financial Statements of the Group for the year ended 31 December 2020.

Annual Report Disclosures

A unanimous resolution was passed by the company pursuant to subsection 211(3) of the Companies Act 1993, that this annual report need not comply with paragraphs (a) and (e) to (j) of subsection 211(1) of the Act.

For and on behalf of the Board:

Director s7(2)(a) [redacted] Date 2021.4.8

Director s7(2)(a) [redacted] Date 08/04/2021

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CONSOLIDATED STATEMENT OF PROFIT OR LOSS AND OTHER COMPREHENSIVE INCOME

For the year ended 31 December 2020

	NOTES	Group 2020 $000	Group 2019 $000
Rendering of Services		**503,458**	519,739
Revenue	2	**503,458**	519,739
Other operating income	2	**11,085**	2,360
Subcontractor expenses		**(61,504)**	(69,100)
Disposal expenses		**(75,938)**	(76,107)
Employee expenses	4	**(124,240)**	(119,353)
Vehicle, plant and machinery operating expenses		**(44,296)**	(50,059)
Other operating expenses		**(54,694)**	(53,012)
Selling & administration expenses		**(13,483)**	(9,773)
Operating profit before financing, impairment, depreciation, associates and tax		**140,388**	144,695
Depreciation expense	7, 27	**(62,395)**	(57,043)
Amortisation expense	8	**(11,241)**	(11,437)
Impairment expense on fixed assets	7	**(240)**	-
Operating profit / (loss) before financing, associates and tax		**66,512**	76,215
Net financing expenses	5	**(79,606)**	(67,198)
Share of profit of associates	10	**8,867**	8,991
Profit / (Loss) before tax		**(4,227)**	18,008
Income tax credit / (expense)	6	**3,969**	(1,107)
Net profit / (loss) for the year		**(258)**	16,901
Profit for the year from continuing operations		**(258)**	16,901
Profit for the year attributable to:			
Equity holders of the Parent		**(258)**	16,901
Other comprehensive income			
Revaluation of hedge contracts	18	**729**	(4,324)
Other comprehensive income for the year		**729**	(4,324)
Total comprehensive income for the year		**471**	12,577
Total comprehensive income for the year attributable to:			
Equity holders of the Parent		**471**	12,577
		471	12,577

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CONSOLIDATED STATEMENT OF CHANGES IN EQUITY

For the year ended 31 December 2020

GROUP		Attributable to the equity holders of the parent				
		Share capital $000	Hedging reserves $000	Capital note reserve $000	Retained earnings $000	Total equity $000
Opening Balance - 1 January 2019		209,988	-	16,525	63,474	289,987
Net profit / (loss) for the period	17, 18	-	-	(5,674)	22,575	16,901
Other comprehensive income	18	-	(4,324)	-	-	(4,324)
Total comprehensive income for the period		-	(4,324)	(5,674)	22,575	12,577
Transactions with owners, recorded directly in equity						
Dividends to shareholders	17	-	-	-	-	-
		-	-	-	-	-
Closing Balance - 31 December 2019		209,988	(4,324)	10,851	86,049	302,564

GROUP		Share capital $000	Hedging reserves $000	Capital note reserve $000	Retained earnings $000	Total equity $000
Opening Balance - 1 January 2020		**209,988**	**(4,324)**	**10,851**	**86,049**	**302,564**
Net profit / (loss) for the year	17, 18	**-**	**-**	**(4,589)**	**4,331**	**(258)**
Other comprehensive income	18	**-**	**729**	**-**	**-**	**729**
Total comprehensive income for the year		**-**	**729**	**(4,589)**	**4,331**	**471**
Transactions with owners, recorded directly in equity						
Dividends to shareholders	17	**-**	**-**	**-**	**-**	**-**
		-	**-**	**-**	**-**	**-**
Closing Balance - 31 December 2020		**209,988**	**(3,595)**	**6,262**	**90,380**	**303,035**

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CONSOLIDATED STATEMENT OF FINANCIAL POSITION

As at 31 December 2020

	NOTES	Group 2020	Group 2019
		$000	$000
ASSETS			
Non current assets			
Investment in associates	10	**96,351**	96,134
Property, plant and equipment	7	**419,100**	398,262
Right of use assets	27	**278,405**	262,700
Intangible assets	8	**718,250**	729,026
Emission units		**9,081**	9,168
		1,521,187	1,495,290
Current assets			
Cash and cash equivalents	13	**26,021**	-
Trade and other receivables	15	**61,047**	80,310
Prepayments		**4,124**	4,514
Inventory	14	**2,560**	2,430
Property held for resale	16	**831**	2,060
Taxation refund		**-**	1,141
		94,583	90,455
TOTAL ASSETS		**1,615,770**	1,585,745
EQUITY			
Share capital	17	**209,988**	209,988
Reserves	18	**2,667**	6,527
Retained earnings	17	**90,380**	86,049
Equity Attributable to equity holders of the Parent		**303,035**	302,564
TOTAL EQUITY		**303,035**	302,564
LIABILITIES			
Non current liabilities			
Closure and post closure provisions	20	**54,186**	47,599
Lease liabilities	27	**277,021**	251,255
Derivative financial instruments - financial liabilities	26	**133**	2,166
Deferred taxation	12	**72,873**	81,867
Loans from related parties	19	**130,098**	750,341
		534,311	1,133,228
Current liabilities			
Cash and cash equivalents	13	**-**	5,000
Interest bearing loans and borrowings	19	**30,000**	42,400
Loans from related parties	25	**637,019**	-
Trade and other payables	21	**59,083**	56,724
Provisions		**18,635**	11,596
Provision for taxation		**244**	-
Revenue received in advance		**16,603**	18,782
Lease liabilities	27	**11,585**	11,164
Derivative financial instruments - financial liabilities	26	**5,255**	4,287
		778,424	149,953
TOTAL LIABILITIES		**1,312,735**	1,283,181
TOTAL EQUITY AND LIABILITIES		**1,615,770**	1,585,745

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CONSOLIDATED STATEMENT OF CASH FLOWS

For the year ended 31 December 2020

	NOTES	Group 2020 $000	Group 2019 $000
Cash Flows from Operating Activities			
Profit Before Tax		**(4,227)**	18,008
Adjustments for:			
Depreciation and Impairment of;			
- Fixed Assets	7	**53,036**	48,181
- Right of Use Assets	27	**9,359**	8,862
- Impairment of Fixed Assets	7	**240**	-
Amortisation and Impairment of Intangible Assets	8	**11,241**	11,437
Loss/(Gain) on sale of property, plant and equipment	3	**(184)**	(37)
Fair value adjustment of contingent consideration	2	**-**	(1,000)
Unrealised foreign exchange gains/(loss)		**433**	-
Share of profit of associates	10	**(8,867)**	(8,991)
Impairment loss on trade receivables	3	**1,409**	49
Net financing expenses	5	**79,606**	67,198
		142,046	143,706
(Increase)/Decrease in Inventories	14	**(130)**	373
(Increase)/Decrease in Prepayments		**390**	(812)
(Increase)/Decrease in Operating Receivables		**17,854**	904
(Increase)/Decrease in Property held for resale	16	**1,229**	2,739
(Increase)/Decrease in Emission units		**2,945**	4,441
(Decrease)/Increase in Operating Payables		**(3,621)**	(17,208)
(Decrease)/Increase in Provisions		**7,038**	1,345
(Decrease)/Increase in Revenue received in advance		**(2,178)**	(451)
(Decrease)/Increase in Derivative financial instruments	26	**(101)**	(807)
(Decrease)/Increase in Lease liabilities		**(219)**	(19)
Decrease in Closure and post closure provisions	20	**(707)**	(1,186)
		164,546	133,024
Interest Paid		**(1,237)**	(1,548)
Interest Received		**42**	275
NRWT Paid		**(5,796)**	(5,677)
Emissions Units Acquired		**(2,858)**	(7,474)
Taxes Paid		**(3,876)**	(2,430)
Net Cash Flows from Operations		**150,821**	116,171
Cash Flows from Investing Activities			
Proceeds from sale of property, plant and equipment		**1,091**	656
Purchases of items of property, plant and equipment	7	**(62,925)**	(72,347)
Purchases of items of intangible assets	8	**(129)**	-
Dividends from associates	10	**8,650**	12,350
Net cash flows used in investing activities		**(53,313)**	(59,341)
Cash Flows from Financing Activities			
New Bank Loans		**10,600**	2,200
Repayment of Bank Loans		**(23,000)**	-
Intercompany Loan paid		**(9,833)**	(11,999)
Interest paid		**(38,540)**	(36,514)
Dividends paid		**-**	-
Principal portion of lease payment / finance lease rental payments		**(5,715)**	(7,179)
Net Cashflows (used in)/from financing activities		**(66,488)**	(53,493)
Closing Balance of Cash on Hand		**26,021**	(5,000)
Minus: Opening Balance of Cash		**(5,000)**	(8,336)
Net Increase/(Decrease) of Cash and Cash Equivalents		**31,021**	3,336

RELEASED UNDER THE LOCAL GOVERNMENT AND MEETINGS ACT 1987

NOTES TO THE CONSOLIDATED FINANCIAL STATEMENTS
For the year ended 31 December 2020

1 SIGNIFICANT ACCOUNTING POLICIES AND ACCOUNTING JUDGEMENTS

Reporting Entity

Beijing Capital Group NZ Investment Holding Limited (the "Company") is a limited liability company incorporated and domiciled in New Zealand.

The Company, its subsidiaries, associates, and joint ventures comprise the Beijing Capital Group NZ Investment Holding Group (the "Group"). The immediate parent of the Group is BCG NZ Investment Holding Limited based in Hong Kong. The ultimate parent of the Group is Beijing Capital Group Co., Limited which is ultimately controlled by the State-owned Assets Supervision and Administration Commission of the Chinese Government.

The Company is a holding company and the Group provides waste management services.

The Company was incorporated and registered under the Companies Act 1993 on 20 May 2014.

The Financial Statements of the Group are for the year ended 31 December 2020.

Statement of Compliance

The consolidated financial statements of the group comply with New Zealand Equivalents to International Financial Reporting Standards Reduced Disclosure Regime (NZ IFRS RDR).

Basis of Preparation

These general purpose financial reports have been prepared in accordance with New Zealand Generally Accepted Accounting Practice (NZ GAAP). For the purposes of complying with NZ GAAP the entity is a for-profit-entity.

The Group is a Tier 2 for-profit entity and has elected to report in accordance with Tier 2 For-Profit Accounting Standards. The Group is eligible to report in accordance with Tier 2 For-Profit Accounting Standards on the basis that it does not have public accountability and is not a large-for-profit public sector entity

The Financial Statements comprise the Consolidated Financial Statements of the Group.

The Company is a reporting entity for the purposes of the Financial Reporting Act 2013 and its Financial Statements comply with that Act.

Basis of Measurement

The Financial Statements are prepared on the historical cost basis except that the following assets and liabilities are stated at their fair value: forward commodity contracts. These Financial Statements are presented in New Zealand dollars ("NZD") and all value are rounded to the nearest thousand ($000), except when otherwise stated.

Significant Accounting Policies

The accounting policies set out below have been consistently applied to all periods presented in these Financial Statements.

Changes in Accounting Policies

There have been no changes in accounting policies during the year.

Basis of Consolidation

The consolidated Financial Statements comprise the Financial Statements of Beijing Capital Group NZ Investment Holding Limited and its subsidiaries as at and for the year ended 31 December 2020. Interests in associates are equity accounted and are not part of the consolidated Group.

Subsidiaries are all those entities over which the Group has the power to govern the financial and operating policies so as to obtain benefits from their activities. The existence and effect of potential voting rights that are currently exercisable or convertible are considered when assessing whether a group controls another entity.

The Financial Statements of the subsidiaries are prepared for the same reporting year as the Parent Company, using consistent accounting policies. In preparing the consolidated Financial Statements, all intercompany balances and transactions, income and expenses, and profits and losses resulting from intra-group transactions have been eliminated in full.

Subsidiaries are fully consolidated from the date on which control is obtained by the Group and cease to be consolidated from the date on which control is transferred out of the Group.

The acquisition of subsidiaries is accounted for using the acquisition method of accounting. The acquisition method of accounting involves recognising at acquisition date, separately from goodwill, the identifiable assets acquired, the liabilities assumed and any non-controlling interest in the acquire. The identifiable assets acquired and the liabilities assumed are measured at their acquisition date fair value.

The difference between the above items and the fair value of the consideration (including the fair value of any pre-existing investment in the acquiree) is goodwill or a discount on acquisition.

A change in the ownership interest of a subsidiary that does not result in a loss of control, is accounted for as an equity transaction.

Profit or loss and each component of other comprehensive income are attributed to the owners (equity holders of the Group) and to the non-controlling interest even if that results in the non-controlling interest having a deficit balance.

If the Group loses control over a subsidiary, it:
- Derecognises the assets (including goodwill) and liabilities of the subsidiary;
- Derecognises the carrying amount of any non-controlling interest;
- Derecognises the cumulative foreign currency translation difference, recorded in reserves;
- Recognises the fair value of any consideration received;
- Recognises the fair value of any investment retained;
- Recognises any surplus or deficit in the Statement of Profit or Loss; and
- Reclassifies the parent's share of components previously recognised in other comprehensive income to the Statement of Profit or Loss.

Acquisition or disposal during the year

Where an entity becomes or ceases to be part of the Group during the year, the results of that entity are included in the Group results from the date of acquisition or up to the date of disposal.

Business combinations

Business combinations are accounted for using the acquisition method. The consideration transferred in a business combination shall be measured at fair value, which shall be calculated as the sum of the acquisition date fair values of the assets transferred by the Group, the liabilities incurred by the Group to former owners of the acquiree and the equity issued by the Group, and the amount of any non-controlling interest in the acquiree. For each business combination, the Group measures the non-controlling interest in the acquiree either at fair value or at the proportionate share of the acquiree's identifiable net assets. Acquisition related costs are expensed as incurred.

When the Group acquires a business, it assesses the financial assets and liabilities assumed for appropriate classification and designation in accordance with the contractual terms, economic conditions, the Group's operating or accounting policies and other pertinent conditions as at the acquisition date.

If the business combination is achieved in stages, the acquisition date fair value of the Group's previously held equity interest in the acquiree is remeasured at fair value as at the acquisition date through the Statement of Profit or Loss.

Any contingent consideration to be transferred by the Group will be recognised at fair value at the acquisition date. Subsequent changes to the fair value of the contingent consideration which is deemed to be an asset or liability will be recognised in accordance with NZ IAS 39 in the Statement of Profit or Loss. If the contingent consideration is classified as equity, it shall not be remeasured.

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NOTES TO THE CONSOLIDATED FINANCIAL STATEMENTS
For the year ended 31 December 2020

Basis of Consolidation (continued)

Business combinations of commonly controlled entities

Business combinations involving entities or businesses under common control are those in which all of the combining entities or businesses are ultimately controlled by the same party or parties both before and after the business combination.

Assets and liabilities assumed in business combinations of commonly controlled entities are measured initially at acquisition date at the book value of the acquired entities. Any difference between the cost of acquisition and the book values of the assets and liabilities acquired is recorded directly in equity.

Investment in Associates, Joint Ventures and Joint Operations

An associate is an entity over which the Company has significant influence. Significant influence is the power to participate in the financial and operating policy decisions of the investee, but is not control or joint control those policies.

A joint venture is a type of joint arrangement whereby the parties that have joint control of the arrangement have rights to the net assets of the joint venture. Joint control is the contractually agreed sharing of control of an arrangement, which exists only when decisions about the relevant activities require unanimous consent of the parties sharing

The Group's investments in associates and joint ventures are stated in the consolidated statement of financial position at the Group's share of net assets under the equity method of accounting, less any impairment losses.

The assets, liabilities, revenues and expenses relating to the Group's interest in a joint operation are accounted for in accordance with the applicable reporting standards as detailed throughout these significant accounting policies and accounting judgements Notes to the Consolidated Financial Statements.

Foreign Currency Translations

The Financial Statements are presented in NZD, which is the Company's functional and presentation currency. All foreign currency transactions and hedges are translated to NZD at the exchange rates prevailing on the day of the transaction and any gains or losses on settlement are recognised in the Statement of Profit or Loss at the time of settlement. All foreign currency assets and liabilities are converted to NZD at the rate applicable at the date of the Statement of Financial Position.

Revenue

Revenue from the rendering of services is recognised inline with the service agreements or contract terms upon delivery of services to the customer. Revenue from the sale of goods is recognised inline with the service agreements or contract terms upon delivery of goods to the customer.

Revenue from contracts with customers is recognised when the control of goods or services is transferred to the customers, at an amount that reflects the consideration to which the Group expects to be entitled in exchange for those goods or services.

When the consideration in a contract includes a variable amount, the amount of consideration is estimated to be that which the Group will be entitled in exchange for transferring the goods or services to the customer. The variable consideration is estimated at contract inception and constrained until it is highly probable that a significant revenue reversal in the amount of cumulative revenue recognised will not occur when the associated uncertainty with the variable consideration is subsequently resolved.

When the contract contains a financing component which provides the customer a significant benefit of financing the transfer of goods or services to the customer for more than one year, revenue is measured at the present value of the amount receivable, discounted using the discount rate that would be reflected in a separate financing transaction between the Group and the customer at contract inception. When the contract contains a financing component which provides the Group a significant financial benefit for more than one year, revenue recognised under the contract includes the interest expense accreted on the contract liability under the effective interest method. For a contract where the period between the payment by the customer and the transfer of the promised goods or services is one year or less, the transaction price is not adjusted for the effects of a significant financing component, using the practical expedient in NZ IFRS 15.

Contracts for services

Contract revenue on the rendering of services comprises the agreed contract amount. Costs of rendering services comprise labour and other costs of personnel directly engaged in providing the services and attributable overheads.

Contract balances

Contract assets

A contract asset is the right to consideration in exchange for goods or services transferred to the customer. If the Group performs by transferring goods or services to a customer before the customer pays consideration or before payment is due, a contract asset is recognised for the earned consideration that is conditional.

Trade receivables

A receivable represents the Group's right to an amount of consideration that is unconditional (i.e., only the passage of time is required before payment of the consideration is due).

Contract liabilities

A contract liability is the obligation to transfer goods or services to a customer for which the Group has received consideration (or an amount of consideration is due) from the customer. If a customer pays consideration before the Group transfers goods or services to the customer, a contract liability is recognised when the payment is made or the payment is due (whichever is earlier). Contract liabilities are recognised as revenue when the Group performs under the contract.

Government Grant

Government grants are recognised where there is reasonable assurance that the grant will be received and all attached conditions will be complied with. When the grant relates to an expense item, it is recognised as income on a systematic basis over the periods that the related costs, for which it is intended to compensate, are expensed.

When the grant relates to an asset, it is recognised as a reduction in the carrying amount of the asset. The grant is then recognised in profit or loss over the useful life of the depreciable asset by way of a reduced depreciation charge.

Other income

Interest income is recognised on an accrual basis using the effective interest method by applying the rate that exactly discounts the estimated future cash receipts over the expected life of the financial instrument or a shorter period, when appropriate, to the net carrying amount of the financial asset.

Dividend income is recognised when the shareholders' right to receive payment has been established, it is probable that the economic benefits associated with the dividend will flow to the Group and the amount of the dividend can be measured reliably.

Goods and Services Tax

All statements are exclusive of Goods and Services Tax ("GST") except receivables and payables which are shown as GST inclusive.

Leases

Lessee

A contract is, or contains, a lease if the contract conveys a right to control the use of an identified asset for a period of time in exchange for consideration. Control is conveyed where the customer has both the right to obtain substantially all of the economic benefits from use of the identified asset and the right to direct the use of the identified asset. All leases with a term of more than 12 months are recognised as assets representing the right of use of the underlying asset and liabilities representing the obligation to make lease payments, unless the underlying asset is of low value. Both the assets and the liabilities are initially measured on a present value basis. Right-of-use assets are recognised under property, plant and equipment and are measured at cost or valuation less any accumulated depreciation and impairment losses, and adjusted for any remeasurement of the lease liabilities. Right-of-use assets are depreciated on a straight-line basis over the shorter of the useful lives of the assets and the lease terms. Lease liabilities are initially measured at the present value of lease payments to be made under the lease terms and subsequently adjusted by the effect of the interest on and the settlement of the lease liabilities, and the re-measurement arising from any reassessment of the lease liabilities or lease modifications.

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NOTES TO THE CONSOLIDATED FINANCIAL STATEMENTS
For the year ended 31 December 2020

Lessor
Where the Group is the lessor, assets leased by the Group are included in non-current assets, and rentals receivable are credited to the statement of profit or loss on the straight-line basis over the lease terms.

Cash and Cash Equivalents
Cash and cash equivalents in the Statement of Financial Position comprise cash at bank and on hand, and short-term deposits with an original maturity of three months or less.

Inventories
Inventories are stated at the lower of cost or net realisable value. Net realisable value is the estimated selling price in the ordinary course of business, less the estimated costs of completion and selling expenses. Costs include the purchase price plus an appropriate proportion of overhead expenditure incurred by the Group. Cost is based on the weighted average cost method and includes expenditure incurred in acquiring the inventories and bringing them to their existing location and condition.

Financial Liabilities
All financial liabilities are recognised initially at fair value and in the case of loans, borrowings and payables net of attributable transaction costs. Subsequent to initial recognition, interest-bearing borrowings are stated at amortised cost with any difference between cost and redemption value being recognised in the Statement of Profit or Loss over the year of the borrowings on an effective interest rate basis.

Trade and Other Receivables
Trade and other receivables are stated at their cost less impairment losses. Trade and other receivables in overseas currency are converted at the end of year rates of exchange. Any debts considered uncollectable are written off against revenue.

The Group applies the simplified approach to provide for expected credit losses prescribed by NZ IFRS 9, which permits the use of the lifetime expected losses for all trade receivables. To measure the expected credit losses, trade receivables have been grouped based on shared credit risk characteristics. Future cash flows for each group of receivables are estimated on the basis of historical loss experience, adjusted to reflect the effects of current conditions as well as forward looking information. Management has closely monitored the credit qualities and the collectability of the trade receivables. Trade receivables in dispute are assessed individually for impairment to determine whether specific loss allowance provisions are required.

Trade and Other Payables
Trade and other payables are carried at amortised cost and due to their short term nature they are not discounted. They represent liabilities for goods and services provided to the Company prior to the end of the financial year that are unpaid and arise when the Company becomes obliged to make future payments in respect of the purchase of these goods and services. The amounts are unsecured and are usually paid within 30 days of recognition.

Property, Plant and Equipment
Depreciation
Depreciation is provided on a straight line basis on all fixed assets, at rates calculated to allocate the asset cost less estimated residual value, over their useful lives. The estimated useful lives of property, plant and equipment are:

	Life in years
Building and site improvements	15 - 25
Leasehold improvements	3 - 10
Plant, machinery and containers	5 - 15
Vehicles and related equipment	3 - 15
Office equipment, furniture and fittings	3 - 5

The residual value of assets is re-assessed annually.

The depreciation of landfill development costs is based on the total anticipated waste volume of the landfill concerned. The depreciation amount is calculated on that portion of total landfill costs represented by the waste volume consumed for the financial year as compared to the total volume.

Future landfill site restoration and aftercare costs capitalised are depreciated at rates that match the pattern of benefits expected to be derived from the respective sites.

Intangible Assets
Goodwill
Goodwill represents the excess of the cost of an acquisition over the fair value of the Group's share of the net identifiable assets of the acquired business, subsidiary or associate at the date of acquisition. Goodwill on the acquisition of businesses or subsidiaries is included in intangible assets. Goodwill on acquisition of associates is included in investments in associates. Goodwill is not amortised. Instead goodwill is tested for impairment annually or more frequently if events or changes in circumstances indicate that it might be impaired, and is carried at cost less accumulated impairment losses. Gains and losses on the disposal of an entity include the carrying amount of goodwill relating to the entity sold.
Goodwill is allocated to cash-generating units (or groups of cash generating units) for the purpose of impairment testing.

Other Intangibles
Intangible assets acquired separately or in a business combination are initially measured at cost. The cost of an intangible asset acquired in a business combination is its fair value as at the date of acquisition. Following initial recognition, intangible assets are carried at cost less any accumulated amortisation and any accumulated impairment losses. Internally generated intangible assets are not capitalised and expenditure is recognised in the Statement of Profit or Loss in the year in which the expenditure is incurred. The useful lives of intangible assets are determined as either finite or indefinite.
Intangible assets with finite lives are amortised over the useful life and tested for impairment when there is an indication that the intangible asset may be impaired. The amortisation year and the amortisation method for an intangible asset with a finite useful life is reviewed annually. The amortisation expense for intangible assets with finite lives is recognised in the Statement of Profit or Loss in the expense category consistent with the function of the intangible asset.

Intangible assets with indefinite useful lives (other than goodwill) are tested for impairment annually, either individually or at the cash-generating unit level. Such intangibles are not amortised.

Impairment
The carrying amounts of the Company's assets are reviewed at each balance date to determine whether there is any indication of impairment. If any such indication exists, the assets recoverable amount is estimated.

If the estimated recoverable amount of an asset is less than its carrying amount, the asset is written down to its estimated recoverable amount and an impairment loss is recognised in the Statement of Profit or Loss.
Estimated recoverable amount of investments and receivables carried at amortised cost is calculated as the present value of estimated future cash flows, discounted at their original effective interest rate. Receivables with a short duration are not discounted. The estimated recoverable amount of other assets is the greater of their fair value less costs to sell and value in use. Value in use is determined by estimating future cash flows from the use and ultimate disposal of the asset and discounting these to their present value using a pre-tax discount rate that reflects current market rates and the risks specific to the assets.

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Emission units
The Group purchases emission units ("EU's") in order to satisfy the obligations in relation to the discharge of methane from the landfills under the Emissions Trading Scheme

EU's purchased are initially measured at cost. Following initial recognition all EU's are carried at cost less any accumulated impairment.

The useful life of EU's are assessed as being a mix of fixed term and indefinite life units and are not amortised.
EU's are tested for impairment annually. When the recoverable amount of EU's is less than the carrying amount, an impairment loss is recognised.

The Group is required to surrender New Zealand Units (NZUs) for their emission obligations under the New Zealand Emissions Trading Scheme. The Group has adopted the net liability/ carrying value approach whereby a provision is recognised for the cost of settlement based on the carrying values of NZUs already held and the cost of buying NZUs when the actual emission obligation exceeds NZUs held by the Group. Where NZUs are purchased from other parties they are recorded at cost. Movements in the carrying value of the emissions liability are recognised in the Statement of Profit or Loss.

Employee Benefits
The liability for employee benefits comprises principally of annual, statutory and long service leave accruals payable at balance date. Annual leave and sick leave are recorded at the undiscounted amount expected to be paid for the entitlement earned. For sick leave, this is based on the unused entitlement accumulated at balance date and expected to be utilised in the future.

Income Tax
The income tax expense charged to the Statement of Profit or Loss includes both the current year's provision and the income tax effect of:
• Taxable temporary differences, except those arising from initial recognition of goodwill and other assets that are not depreciated; and
• Deductible temporary differences to the extent that it is probable that they will be utilised.

Current tax assets and liabilities for the current and prior years are measured at the amount expected to be recovered from or paid to the taxation authorities based on the current year's taxable income. The tax rates and tax laws used to compute the amount are those that are enacted or subsequently enacted by the reporting date.

Tax effect accounting is applied on a comprehensive basis to all temporary differences using the liability method. A deferred tax asset is only recognised to the extent that it is probable there will be future taxable profit to utilise the temporary differences. Temporary differences arising from transactions, other than business combinations, affecting neither accounting profit nor taxable profit are ignored.

Deferred tax is not recognised on temporary differences associated with investments in subsidiaries because:
• The parent company is able to control the timing of the reversal of the differences; and
• They are not expected to reverse in the foreseeable future.

Deferred income tax assets and liabilities are measured at the tax rates that are expected to apply to the year when the asset is realised or the liability is settled, based on tax rates (and tax laws) that have been enacted or subsequently enacted at the reporting date.

Deferred tax assets are offset only if a legally enforceable right exists to set off current assets against current tax liabilities and the deferred tax assets and liabilities relate to the same taxable entity and authority.

Financial Instruments
Financial instruments are recognised in the Statement of Financial Position when the Company becomes party to a financial contract. They include the following individual classes of assets and liabilities:

Loans and receivables
Bank deposits, bank overdrafts, trade and other receivables, intercompany balances and investments in unlisted debt securities are classified as loans and receivables. All of the above financial instruments are initially recorded at cost and subsequently carried at amortised cost using the effective interest rate method. Due allowance is made for impaired receivables (doubtful debts).
Debt instruments are measured at amortised cost using the effective interest rate method, subject to impairment if the assets are held for the collection of contractual cash flows where those contractual cash flows represent solely payments of principal and interest.

Debt instruments are measured at fair value through other comprehensive income if the assets' contractual cash flows represent solely payments of principal and interest and the assets are held for collection of contractual cash flows and for selling the financial assets. Such financial assets are subsequently measured at fair value with any gains or losses from changes in fair value recognised in other comprehensive income, except for impairment losses and reversal, foreign exchange gains and losses and interest calculated using the effective interest rate method which are recognised in the statement of profit or loss. The cumulative gains or losses previously recognised in other comprehensive income are reclassified from other comprehensive income to the statement of profit or loss when the financial asset is derecognised.

Debt instruments that do not meet the criteria for amortised cost or as financial assets at fair value though other comprehensive income are measured at fair value through profit or loss. Interest income for these financial assets is included in finance income.

Equity investments are measured at fair value through profit or loss unless, on initial recognition, the Group has irrevocably elected to designate such investments that are not held for trading as equity investments at fair value through other comprehensive income. Dividends of such investments are recognised in the statement of profit or loss when the Group's right to receive payment is established. Changes in the fair value of such investments are recognised in other comprehensive income and are never recycled to the statement of profit or loss even when the assets are sold.
The Group applies the expected credit loss model on all the financial assets that are subject to impairment, financial guarantee contracts, contract assets under NZ IFRS 15 and lease receivables under NZ IFRS 16. For trade receivables and contract assets without a significant financial component, the Group applies the simplified approach which requires impairment allowances to be measured at lifetime expected credit losses.

For other financial assets, impairment allowances are recognised under the general approach where expected credit losses are recognised in two stages. For credit exposures where there has not been a significant increase in credit risk since initial recognition, the Group is required to provide for credit losses that result from possible default events within the next 12 months. For those credit exposures where there has been a significant increase in credit risk since initial recognition, a loss allowance is required for credit losses expected over the remaining life of the exposure irrespective of the timing of the default.

The Group considers a default has occurred when a financial asset is more than 90 days past due unless the Group has reasonable and supportable information to demonstrate that a more appropriate default criterion should be applied.

If an available-for-sale financial asset measured at fair value is impaired, an amount comprising the difference between its cost (net of any principal payment and amortisation) and its current fair value, less any impairment loss previously recognised in the statement of profit or loss, is removed from other comprehensive income and recognised in the statement of profit or loss. Impairment losses on equity instruments classified as available for sale are not reversed through the statement of profit or loss. Increases in their fair values after impairment are recognised directly in other comprehensive income. Impairment losses on debt instruments are reversed through the statement of profit or loss, if the increase in the fair value of the instrument can be objectively related to an event occurring after the impairment loss was recognised in the statement of profit or loss.

If there is objective evidence that an impairment loss has been incurred for unquoted equity investments measured at cost less impairment, the amount of the loss is measured as the difference between the asset's carrying amount and the present value of estimated future cash flows discounted at the current market rate of return for a similar financial asset. Impairment losses on these assets are not reversed.

Financial assets are derecognised when the rights to receive cash flows from the assets have expired; or where the Group has transferred its contractual rights to receive the cash flows of the financial assets and has transferred substantially all the risks and rewards of ownership; or where control is not retained.

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Financial Instruments (continued)
Derivative financial instruments and hedge accounting
Initial recognition and subsequent measurement
The Group uses derivative financial instruments, such as forward currency contracts and interest rate swaps, to hedge its foreign currency risk and interest rate risk, respectively. Such derivative financial instruments are initially recognised at fair value on the date on which a derivative contract is entered into and are subsequently remeasured at fair value. Derivatives are carried as assets when the fair value is positive and as liabilities when the fair value is negative.

The fair value of commodity purchase contracts that meet the definition of a derivative as defined by NZ IFRS 9 is recognised in the statement of profit or loss as cost of sales. Commodity contracts that are entered into and continue to be held for the purpose of the receipt or delivery of a non-financial item in accordance with the Group's expected purchase, sale or usage requirements are held at cost.

Any gains or losses arising from changes in fair value of derivatives are taken directly to the statement of profit or loss, except for the effective portion of cash flow hedges, which is recognised in other comprehensive income and later reclassified to profit or loss when the hedged item affects profit or loss.

For the purpose of hedge accounting, hedges are classified as:
• fair value hedges when hedging the exposure to changes in the fair value of a recognised asset or liability or an unrecognised firm commitment; or
• cash flow hedges when hedging the exposure to variability in cash flows that is either attributable to a particular risk associated with a recognised asset or liability or a highly probable forecast transaction, or a foreign currency risk in an unrecognised firm commitment; or
• hedges of a net investment in a foreign operation.

At the inception of a hedge relationship, the Group formally designates and documents the hedge relationship to which the Group wishes to apply hedge accounting, the risk management objective and its strategy for undertaking the hedge.

The documentation includes identification of the hedging instrument, the hedged item, the nature of the risk being hedged and how the Group will assess whether the hedging relationship meets the hedge effectiveness requirements (including the analysis of sources of hedge ineffectiveness and how the hedge ratio is determined). A hedging relationship qualifies for hedge accounting if it meets all of the following effectiveness requirements:
• There is "an economic relationship" between the hedged item and the hedging instrument.
• The effect of credit risk does not "dominate the value changes" that result from that economic relationship.
• The hedge ratio of the hedging relationship is the same as that resulting from the quantity of the hedged item that the Group actually hedges and the quantity of the hedging instrument that the Group actually uses to hedge that quantity of hedged item.

Hedges which meet all the qualifying criteria for hedge accounting are accounted for as follows:

Cash flow hedges
The effective portion of the gain or loss on the hedging instrument is recognised directly in other comprehensive income in the cash flow hedge reserve, while any ineffective portion is recognised immediately in the statement of profit or loss. The cash flow hedge reserve is adjusted to the lower of the cumulative gain or loss on the hedging instrument and the cumulative change in fair value of the hedged item.

The amounts accumulated in other comprehensive income are accounted for, depending on the nature of the underlying hedged transaction. If the hedged transaction subsequently results in the recognition of a non-financial item, the amount accumulated in equity is removed from the separate component of equity and included in the initial cost or other carrying amount of the hedged asset or liability. This is not a reclassification adjustment and will not be recognised in other comprehensive income for the period. This also applies where the hedged forecast transaction of a non-financial asset or non-financial liability subsequently becomes a firm commitment to which fair value hedge accounting is applied.

For any other cash flow hedges, the amount accumulated in other comprehensive income is reclassified to the statement of profit or loss as a reclassification adjustment in the same period or periods during which the hedged cash flows affect the statement of profit or loss.

If cash flow hedge accounting is discontinued, the amount that has been accumulated in other comprehensive income must remain in accumulated other comprehensive income if the hedged future cash flows are still expected to occur. Otherwise, the amount will be immediately reclassified to the statement of profit or loss as a reclassification adjustment. After the discontinuation, once the hedged cash flow occurs, any amount remaining in accumulated other comprehensive income is accounted for depending on the nature of the underlying transaction as described above.

If cash flow hedge accounting is discontinued, the amount that has been accumulated in other comprehensive income must remain in accumulated other comprehensive income if the hedged future cash flows are still expected to occur. Otherwise, the amount will be immediately reclassified to the statement of profit or loss as a reclassification adjustment. After the discontinuation, once the hedged cash flow occurs, any amount remaining in accumulated other comprehensive income is accounted for depending on the nature of the underlying transaction as described above.

Fair value hedges
The change in the fair value of a hedging instrument is recognised in the statement of profit or loss as other expenses. The change in the fair value of the hedged item attributable to the risk hedged is recorded as a part of the carrying amount of the hedged item and is also recognised in the statement of profit or loss as other expenses.

For fair value hedges relating to items carried at amortised cost, the adjustment to carrying value is amortised through the statement of profit or loss over the remaining term of the hedge using the effective interest rate method. Effective interest rate amortisation may begin as soon as an adjustment exists and shall begin no later than when the hedged item ceases to be adjusted for changes in its fair value attributable to the risk being hedged. If the hedged item is derecognised, the unamortised fair value is recognised immediately in the statement of profit or loss.

When an unrecognised firm commitment is designated as a hedged item, the subsequent cumulative change in the fair value of the firm commitment attributable to the hedged risk is recognised as an asset or liability with a corresponding gain or loss recognised in the statement of profit or loss. The changes in the fair value of the hedging instrument are also recognised in the statement of profit or loss.

Current versus non-current classification
Derivative instruments that are not designated as effective hedging instruments are classified as current or non-current or separated into current and non-current portions based on an assessment of the facts and circumstances (i.e., the underlying contracted cash flows).

• Where the Group expects to hold a derivative as an economic hedge (and does not apply hedge accounting) for a period beyond 12 months after the end of the reporting period, the derivative is classified as non-current (or separated into current and non-current portions) consistently with the classification of the underlying item.
• Embedded derivatives that are not closely related to the host contract are classified consistently with the cash flows of the host contract.
• Derivative instruments that are designated as, and are effective hedging instruments, are classified consistently with the classification of the underlying hedged item. The derivative instruments are separated into current portions and non-current portions only if a reliable allocation can be made.

Financial Instruments (continued)
Other financial liabilities
Bank loans and finance leases are initially recorded at fair value less attributable transaction costs. Subsequent to initial recognition, borrowings are stated at amortised cost with any difference between cost and redemption value being recognised in the Statement of Profit or Loss over the year of the borrowings on an effective interest rate basis. Borrowing costs are expensed in the year in which they occur. Borrowing costs consist of interest and other costs that an entity incurs in connection with the borrowing of funds.

Provisions
A provision is recognised when the Company has a present legal or constructive obligation as a result of a past event, and it is probable that an outflow of economic benefits will be required to settle the obligation. If the effect is material, provisions are determined by discounting the expected future cash flows at a pre-tax rate that reflects current market rates and, where appropriate, the risks specific to the liability.

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Issued Capital

Issued and paid up capital is recognised at the fair value of the consideration received by the Company. Any transaction costs incurred by the Company arising on the issue of capital are recognised directly in equity as a reduction of the share proceeds received.

Capital Management

The Company's capital is its shareholders equity which comprises of ordinary shares issued and paid up, retained earnings and reserves. Equity is represented by net assets. The Company manages its revenues, expenses, assets, liabilities, and general financial dealings prudently. The Company's equity is largely managed as a by-product of managing income, expenses, assets, liabilities, and compliance with budgeting processes and Board of Director instructions. The objective of managing the Company's equity is to ensure the Company effectively achieves it goals and objectives for which it has been established, whilst remaining a going concern.

Closure and Post Closure Costs

A provision for future landfill site restoration and aftercare costs is recognised when the activities giving rise to the need for site restoration and aftercare have commenced. The provision is stated at the present value of the future cash flows expected to be incurred, which increases each year due to the passage of time. Any increase in the provision due to the change in present value is recognised in the Statement of Profit or Loss as a time value adjustment.

Onerous Contracts

A provision for an onerous contract is recognised when the expected benefits to be derived by the Company from a contract are lower than the unavoidable cost of meeting its obligations under the contract.

Going Concern

No material uncertainties exist at or after balance date, that relate to events or conditions that may cast significant doubt on the Group or Company's ability to continue as a going concern.

Accounting Judgements, Estimates and Assumptions

The preparation of the Group's consolidated financial statements requires management to make judgement, estimates and assumption that affect the reported amounts of revenues, expenses, assets, liabilities, the accompanying disclosures and the disclosure of contingent liabilities. Uncertainty about these assumptions and estimates could result in outcomes that require a material adjustment to the carrying amount of the assets or liabilities in future periods.

Estimation uncertainty

The key assumptions concerning the future and other key sources of estimation uncertainty at the end of the reporting period, that have a significant risk of causing a material adjustment to the carrying amounts of assets and liabilities within the next financial year, are described below.

Impairment of non-current assets other than financial assets (other than goodwill)

The Group assesses whether there are any indicators of impairment for all non-financial and non-current assets at the end of each reporting period. Indefinite life intangible assets are tested for impairment annually and at other times when such an indicator exists. Other non-financial assets are tested for impairment when there are indicators that the carrying amounts may not be recoverable. An impairment exists when the carrying value of an asset or a cash-generating unit exceeds its recoverable amount, which is the higher of its fair value less costs of disposal and its value in use. The calculation of the fair value less costs of disposal is based on available data from binding sales transactions in an arm's length transaction of similar assets or observable market prices less incremental costs for disposing of the asset. When value in use calculations are undertaken, management must estimate the expected future cash flows from the asset or cash-generating unit and choose a suitable discount rate in order to calculate the present value of those cash flows.

Impairment of goodwill

The Group determines whether goodwill is impaired at least on an annual basis. This requires an estimation of the value in use of the cash-generating units to which the goodwill is allocated. Estimating the value in use requires the Group to make an estimate of the expected future cash flows from the cash-generating units and also to choose a suitable discount rate in order to calculate the present value of those cash flows. The carrying amount of goodwill at 31 December 2020 was $441.534 million (2019: $441.534 million). Further details are given in Note 8.

Impairment of trade receivables

The impairment provisions for trade receivables and other receivables are based on assumptions about expected credit losses. The Group uses judgements in making these assumptions and selecting the inputs to the impairment calculation, based on the number of days that an individual receivable is outstanding as well as the Group's historical experience and forward-looking information at the end of each reporting period. Changes in these assumptions and estimates could materially affect the results of the assessment and it may be necessary to make an additional impairment charge to profit or loss. Further details of the trade receivables and other receivables are given in note 15 to the financial statements.

Income tax

When providing for income tax, as a result of certain issues on income tax has yet to be confirmed by the tax authorities, estimation has to be made on the basis of the existing tax laws and regulations and other relevant policies. If the relevant matters of the final tax result is different from the estimation amount, the difference will affect the current income tax.

Estimated useful lives and residual value of fixed assets

When estimating useful lives and residual value of fixed assets, the following factors are considered: innovation and improvement, the products or services market demand related to asset changes which results in the outdated of the technical or commercial, intended use of the assets, physical abrasion, maintenance of assets, the laws about use of assets or similar restrictions. The estimate of useful lives of the relevant assets is based on the Group's experience of using similar assets in a similar condition. The estimated life of the landfill asset is dependent on both the resource consent period and estimated time to reach full capacity of the landfill. If the useful lives and residual value of fixed assets are inconsistent with previous estimates, the depreciation may need to be adjusted. The useful lives and residual value will be reviewed at each year end depending on the situation.

Provisions for site restoration

A provision for future landfill site restoration and aftercare costs is recognised when the activities giving rise to the need for site restoration and aftercare have commenced. Management estimates the present value of the future cash flows expected to be incurred, which increases each period due to the passage of time. Any increase in the provision due to the change in present value is recognised in the Statement of Profit or Loss as a time value adjustment. Management will re-evaluate the estimate at the end of each reporting period.

Future landfill site restoration and aftercare costs provided for are initially capitalised in the statement of financial position. Any change in the provision for future landfill site restoration and aftercare costs arising from a change in estimate of those costs is also recognised in non-current assets in the Statement of Financial Position.

Restoration provision are discounted to present value using a risk free rate published by the New Zealand Treasury Department. Future estimated costs are inflated by using a rate published by the New Zealand Treasury Department

Adjustments in fair value due to changes in estimated future cash flows or timing assumptions are recorded as a change in both the remediation asset and the liability at the time the change in estimate is made.

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2 REVENUE AND OTHER OPERATING INCOME

	Group 2020 $000	Group 2019 $000
Revenue represents the net sales from collections, landfill, recycling, technical services of waste management.		
An analysis of revenue, other income and gains is as follows:		
Collections	**334,824**	333,499
Landfill	**97,771**	108,489
Recycling	**16,712**	23,690
Technical Services	**54,459**	53,457
Others	**(308)**	604
Total Revenue	**503,458**	519,739
Other income	**345**	1,154
Gain on sale of property, plant and equipment	**184**	-
Fair value adjustment of contingent consideration	**-**	1,000
Directors Fees	**100**	100
Management Fees	**15**	14
Dividend income	**6**	13
Net Foreign Exchange Gains/(Losses)	**(394)**	79
Government Subsidy	**10,829**	-
Total other income	**11,085**	2,360

Revenue from contracts with customers

Performance obligations

Information about the Group's performance obligations is summarised below:

Waste collection, landfill and technical services

The performance obligation is satisfied at the point in time when promised service is rendered to a customer, and payment in advance for waste collection is normally required and payment for landfill and technical services is generally due within 50 days as the term of agreements.

Recycling

The performance obligation is satisfied at the point in time when a promised good or service is transferred to a customer and payment is generally due within 50 days upon the transfer.

3 PROFIT BEFORE TAX

	Group 2020 $000	Group 2019 $000
Included within profit before tax are the following items:		
Loss/(Gain) on sale of property, plant and equipment	**(184)**	(37)
Donations	**57**	52
Impairment loss on trade receivables	**1,409**	49
Lease payments not included in the measurement of lease liabilities	**7,735**	6,355

4 EMPLOYEE EXPENSES

	Group 2020 $000	Group 2019 $000
Wages and salaries	**117,930**	112,260
Other benefits	**6,310**	7,093
Total personnel costs	**124,240**	119,353

5 NET FINANCING EXPENSES

	NOTES	Group 2020 $000	Group 2019 $000
Interest income - other		**(42)**	(272)
Total interest income		**(42)**	(272)
Interest expense:			
- leases		**12,381**	2,879
- related parties	25	**65,496**	62,107
- other		**899**	1,107
Time value adjustment			
- Unwinding of provision	20	**464**	1,000
- Performance Bond Fee		**408**	377
Total interest expense		**79,648**	67,470
Net finance expense		**79,606**	67,198

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6 TAXATION EXPENSE

	Group 2020 $000	Group 2019 $000
Income tax expense recognised in the Statement of Profit or Loss		
Current tax expense	**(5,294)**	(5,396)
Deferred tax expense	**9,263**	4,289
Total income tax credit / (expense) in Statement of Profit or Loss	**3,969**	(1,107)
Reconciliation of effective tax rate		
Profit / (Loss) before tax	**(4,227)**	18,007
Income tax using the domestic corporation tax rate	**1,184**	(5,042)
Non-taxable income	**-**	1
Non-deductible expenses	**633**	1,620
Non-deductible goodwill and other intangibles	**-**	-
Non-deductible investment impairment	**-**	-
Non-taxable income received from associates	**2,484**	2,517
Adjustment relating to prior period	**(360)**	(193)
Others	**28**	(11)
Total income tax credit / (expense) in Statement of Profit or Loss	**3,969**	(1,107)
Income Tax recognised directly in other comprehensive income		
Deferred Tax	**270**	(1,682)
Total Income tax recognised in other comprehensive income	**270**	(1,682)

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7 Property Plant and Equipment

	Land	Buildings and Site improvements	Vehicles and related equipment	Plant, machinery & containers	Leasehold	Capital WIP	Landfill development	Total
	$000	$000	$000	$000	$000	$000	$000	$000
Cost								
As at 1 January 2020	38,164	21,321	129,979	199,876	14,501	80,535	113,769	**598,145**
Transfers [1]	-	403	16,538	35,048	9,351	(67,365)	5,828	**(197)**
Additional Landfill Provision	-	-	-	-	-	-	6,830	**6,830**
Additions	-	-	-	-	-	62,925	-	**62,925**
Disposal	-	(5)	(4,137)	(5,332)	(52)	-	-	**(9,526)**
Other Movement	-	-	-	-	-	5,610	-	**5,610**
Acquired on acquisition of business	-	-	-	-	-	-	-	**-**
Cost as at 31 December	**38,164**	**21,719**	**142,380**	**229,592**	**23,800**	**81,705**	**126,427**	**663,787**
Accumulated Depreciation								
As at 1 January 2020	-	(9,526)	(52,572)	(87,593)	(4,460)	-	(45,732)	**(199,883)**
Acquired on acquisition of subsidiaries	-	-	-	-	-	-	-	**-**
Depreciation for the year	-	(2,018)	(14,776)	(25,712)	(1,331)	-	(9,199)	**(53,036)**
Disposals	-	5	4,090	4,471	52	-	-	**8,618**
Transfers [1]	-	-	-	(146)	-	-	-	**(146)**
Other	-	-	-	(240)	-	-	-	**(240)**
Accumulated Depreciation as at 31 December	**-**	**(11,539)**	**(63,258)**	**(109,220)**	**(5,739)**	**-**	**(54,931)**	**(244,687)**
Net Book Value								
As at 31 December 2019	**38,164**	**11,795**	**77,407**	**112,283**	**10,041**	**80,535**	**68,037**	**398,262**
As at 31 December 2020	**38,164**	**10,180**	**79,122**	**120,372**	**18,061**	**81,705**	**71,496**	**419,100**

	Land	Buildings and Site improvements	Vehicles and related equipment	Plant, machinery & containers	Leasehold	Capital WIP	Landfill development	Total
	$000	$000	$000	$000	$000	$000	$000	$000
Cost								
As at 1 January 2019	36,574	19,969	114,037	171,862	13,849	65,410	105,259	**526,960**
Transfers [1]	1,590	1,395	22,254	34,032	653	(67,843)	7,919	**-**
Additional Landfill Provision	-	-	-	-	-	-	591	**591**
Additions	-	-	-	-	-	72,347	-	**72,347**
Disposal	-	(43)	(6,312)	(6,018)	(1)	-	-	**(12,374)**
Other Movement	-	-	-	-	-	10,621	-	**10,621**
Acquired on acquisition of business	-	-	-	-	-	-	-	**-**
Cost as at 31 December	**38,164**	**21,321**	**129,979**	**199,876**	**14,501**	**80,535**	**113,769**	**598,145**
Accumulated Depreciation								
As at 1 January 2019	-	(7,522)	(45,237)	(71,078)	(2,997)	-	(36,624)	**(163,458)**
Acquired on acquisition of subsidiaries	-	-	-	-	-	-	-	**-**
Depreciation for the year	-	(2,028)	(13,274)	(22,481)	(1,289)	-	(9,108)	**(48,180)**
Disposal	-	15	5,935	5,804	1	-	-	**11,755**
Transfers [1]	-	9	4	162	(175)	-	-	**-**
Other	-	-	-	-	-	-	-	**-**
Accumulated Depreciation as at 31 December	**-**	**(9,526)**	**(52,572)**	**(87,593)**	**(4,460)**	**-**	**(45,732)**	**(199,883)**
Net Book Value								
As at 31 December 2018	**36,574**	**12,447**	**68,800**	**100,784**	**10,852**	**65,410**	**68,635**	**363,502**
As at 31 December 2019	**38,164**	**11,795**	**77,407**	**112,283**	**10,041**	**80,535**	**68,037**	**398,262**

(1) Net transfer out value of ($343) (2019: $Nil) represents Capital WIP acquired and build in the prior and current periods which on completion was recognised as intangibles. Offset by the capitalisation of a deposit paid in the prior period on a property settled / purchased during the current period.

This includes:

	NOTES	Group 2020 $000	Group 2019 $000
Software recognised as intangible assets	8	(343)	-
Property purchase deposit from prepayments		-	-
Total Transfers		**(343)**	**-**

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8 INTANGIBLE ASSETS

	NOTES	Group 2020 $000	Group 2019 $000
Goodwill			
Opening Balance as at beginning of year		**441,534**	441,534
Goodwill balance as at 31 December		**441,534**	441,534
Other intangibles - customer contracts & consent costs			
Opening Balance as at beginning of year		**287,492**	298,929
Consent costs incurred		**129**	-
Amortisation of Customer Contracts		**(2,414)**	(2,414)
Amortisation of Resource Consents		**(6,641)**	(6,634)
Amortisation of Build Operate Transfer Facility		**(1)**	(168)
Amortisation of Software		**(2,185)**	(2,221)
Transfer of Software from CWIP	7	**372**	-
Build Operate Transfer recognised		**(29)**	-
Disposal of Build Operate Transfer Facility		**(7)**	-
Other intangibles balance as at 31 December		**276,716**	287,492
Total intangibles balance		**718,250**	729,026

Other intangible assets represent customer relationships and contracts recorded at their fair value on acquisition and are amortised over the term of the contracts.

Impairment tests for Intangible assets:
The Group is considered to be one cash generating unit.

This represents the lowest level within the Group at which the goodwill and other intangibles are monitored for internal management purposes.

Key assumptions used for value-in-use calculation:
The recoverable amount of the cash generating unit has been based on value in use calculations.

These calculations use cash flow projections based on actual operating results and financial budgets approved by management.
The cash generating unit's cash flows are forecast over 5 years using a nominal EBITDA average growth rate of -1.41% and a 2.50% terminal rate over perpetuity.
A discount rate of 7.08% has been used in discounting the projected cash flows.
These assumptions have been used for the analysis of the cash generating unit. Management determined the budgeted gross margin based on past performance and its' expectations for the market's development. The growth rates used are consistent with the forecasts included in industry reports. The discount rates used reflect specific risks relating to the relevant segment.

9 INVESTMENT IN SUBSIDIARIES

Investment in subsidiaries
Beijing Capital Group NZ Investment Holding Limited's investment in subsidiaries comprises shares at cost. The significant subsidiaries comprise of:

		Interest held by Group 2020 %	2019 %
Investment in subsidiaries - companies incorporated in New Zealand	**Principal Activities**		
Waste Management NZ Limited	Waste Management Services	**100**	100
Tartan Industries Limited	Property Holding	**100**	100
Waste Care Limited	Name Protection	**100**	100
Waste Disposal Services Limited	Name Protection	**100**	100
Flexi-Bin Limited	Name Protection	**100**	100
Sunshine Garden Bag and Bin Company Limited	Name Protection	**100**	100
Budget Bins Ltd	Name Protection	**100**	100
Waste Management All Brite Limited	Name Protection	**100**	100
Gordies Bags Limited	Name Protection	**100**	100
Gordies Skip Bins Limted	Name Protection	**100**	100
Gordies Bins Limited	Name Protection	**100**	100
Healthcare Waste Limited	Name Protection	**100**	100
Living Earth Limited	Name Protection	**100**	100
Waste Management Limited	Name Protection	**100**	100
The Wheelibin Company Limited	Name Protection	**100**	100
Get-A-Bin Limited	Name Protection	**100**	100
Eastern Bins Limited	Name Protection	**100**	100
Waste Management Collections Limited	Name Protection	**100**	100
BCG Waste Management Limited	Name Protection	**100**	100
Canterbury Waste Services Limited	Name Protection	**100**	100
Recycle New Zealand Limited	Name Protection	**100**	100
Otago Waste Services Limited	Name Protection	**100**	100
Pacific Rubber Recycling Limited	Name Protection	**100**	100
ERS New Zealand Limited	Name Protection	**100**	100
Canterbury Material Recovery Facilities Limited	Name Protection	**100**	100
Waste Management Solutions (NZ) Limited	Name Protection	**100**	100
Waste Services Marlborough Limited	Name Protection	**100**	100
Waste Management Technical Services Limited	Name Protection	**100**	100
Waste Management Recycling Limited	Name Protection	**100**	100

(i) All subsidiaries are New Zealand entities that are direct subsidiaries of the Company and have a 31 December balance date. There are no significant restrictions on the ability of the subsidiary to pay dividends, repay loans or otherwise transfer funds to the Parent.

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10 INVESTMENT IN ASSOCIATES

a) Movements in the carrying amount of the Group's investment in associates

	Group 2020 $000	Group 2019 $000
Balance as at beginning of year	**96,134**	99,493
Divestment / release to Statement of profit or loss	**-**	-
Dividends received	**(8,650)**	(12,350)
Share of profit/(loss)	**9,708**	9,879
Amortisation of identified intangible consent costs	**(841)**	(888)
Balance as at 31 December	**96,351**	96,134

b) Investment details
Summary financial information on associates - 100 per cent

Name	Country of Incorporation	Nature of Business	Assets $000	Liabilities $000	Revenue $000	Profit/ (Loss) $000	% Interest Held
2020							
Midwest Disposals Limited	New Zealand	Landfill Operation & Refuse Transfer Station	**40,111**	**14,379**	**10,684**	**3,431**	50
Pikes Point Transfer Station Limited	New Zealand	Refuse Transfer Station	**5,906**	**1,567**	**3,497**	**195**	50
Transwaste Canterbury Limited	New Zealand	Landfill Operation	**119,085**	**43,828**	**21,495**	**5,234**	50
Daniels Sharpsmart New Zealand Limited	New Zealand	Supply & Cleaning of Reusable Sharps Containers	**1,638**	**903**	**902**	**7**	50
Total			**166,740**	**60,677**	**36,578**	**8,867**	
2019							
Midwest Disposals Limited	New Zealand	Landfill Operation & Refuse Transfer Station	39,546	15,676	9,886	2,993	50
Pikes Point Transfer Station Limited	New Zealand	Refuse Transfer Station	6,091	2,142	3,835	188	50
Transwaste Canterbury Limited	New Zealand	Landfill	121,969	44,879	21,061	5,773	50
Daniels Sharpsmart New Zealand Limited	New Zealand	Supply & Cleaning of Reusable Sharps Containers	1,582	862	822	37	50
Total			169,188	63,559	35,604	8,991	

All Joint Venture Companies are measured using the equity method of accounting

11 INVESTMENT IN JOINT OPERATIONS

The Group has a 50% interest in Waste Disposal Services, an unincorporated joint venture with Auckland Council Property Limited. Waste Disposal Services operates a landfill and refuse station in South Auckland. Audit New Zealand perform the audit of Waste Disposal Services each year. Waste Disposal Services balance date is 30 June. The following share of material assets and liabilities of Waste Disposal Services have been included in the Financial Statements:

	Group 2020 $000	Group 2019 $000
Assets		
Current assets	**5,432**	2,152
Non current assets	**20,247**	18,977
	25,679	21,129
Liabilities		
Current liabilities	**1,252**	1,061
Non current liabilities	**8,507**	6,956
	9,759	8,017
Net assets	**15,920**	13,112
Share of revenues	**10,472**	10,192
Share of expenses	**(5,889)**	(5,692)
Share of operating surplus before taxation	**4,583**	4,500
Share of the joint operation's other comprehensive income	**(276)**	(521)
Cash Received	**(1,500)**	(5,000)

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12 DEFERRED TAXATION

	Consolidated Statement of Financial Position		Consolidated Statement of Profit or Loss	
Deferred tax relates to the following assets and liabilities	**Group 2020 $000**	Group 2019 $000	**Group 2020 $000**	Group 2019 $000
Property, plant and equipment	**(25,495)**	(24,649)	**(846)**	(578)
Trade and other receivables	**588**	629	**(42)**	369
Intangibles	**(73,194)**	(74,975)	**1,781**	2,370
Provisions	**19,215**	17,062	**2,153**	(441)
Employee benefits	**3,706**	2,132	**1,575**	(97)
Derivative financial instruments	**1,412**	1,682	**-**	-
Right of use assets	**(77,480)**	(73,011)	**(4,469)**	(73,011)
Lease liabilities	**80,810**	73,477	**7,333**	73,477
Other	**(2,436)**	(4,214)	**1,778**	2,200
Tax assets / (liabilities)	**(72,874)**	(81,867)	**9,263**	4,289

	Consolidated Statement of Comprehensive Income		Balances Acquired	
	Group 2020 $000	Group 2019 $000	**Group 2020 $000**	Group 2019 $000
Derivative financial instruments	**(270)**	1,682	**-**	-
Tax assets / (liabilities)	**(270)**	1,682	**-**	-

Reflected in the statement of Financial Position as follows:		
Deferred tax assets - Continuing Operations	**24,921**	21,504
Deferred tax liabilities - Continuing Operations	**(97,794)**	(103,371)
Deferred Net Tax Liability	**(72,874)**	(81,867)

13 BANK AND BANK OVERDRAFT (Unsecured)

	Group 2020 $000	**Group 2019 $000**
Cash at bank and in hand	**26,021**	(5,000)
Total bank balances as at 31 December	**26,021**	(5,000)

The Group's overdraft facility is $5 million with ANZ and the interest costs at a rate of the reference rate plus a margin of 2.00% per annum.

14 INVENTORY

	Group 2020 $000	**Group 2019 $000**
Raw Materials	**(61)**	327
Finished goods	**2,621**	2,103
Total inventory as at 31 December	**2,560**	2,430

15 TRADE AND OTHER RECEIVABLES

Current receivables	**NOTES**	**Group 2020 $000**	**Group 2019 $000**
Trade receivables			
- related parties	25	**3,158**	236
- non related parties		**55,164**	73,131
		58,322	73,367
Other receivables		**2,725**	6,943
Total current receivables as at 31 December		**61,047**	80,310

The Group applies the simplified approach to provide for expected credit losses, which permits the use of the lifetime expected loss for all trade receivables. To measure the expected credit losses, trade receivables have been grouped based on shared credit risk characteristics and the days past due. The expected credit losses have also incorporated forward looking information. The loss allowance as at 31 December 2020 is determined as follows:

As at 31 December 2020	Current	Past due: Less than 1 month	Past due: 1 to 3 months	Past due: Over 3 months	Total
	$000	**$000**	**$000**	**$000**	**$000**
Expected credit loss rate	0.3532%	2.3397%	8.2576%	22.4335%	3.3233%
Gross carrying amount	52,047	2,076	1,113	7,909	63,146
Expected credit losses	**(184)**	**(49)**	**(92)**	**(1,774)**	**(2,099)**

16 PROPERTY HELD FOR RESALE

	Group 2020 $000	**Group 2019 $000**
Vehicles	**826**	2,051
Containers	**5**	9
Total property held for resale as at 31 December	**831**	2,060

Assets held for sale consist of the following:
- Assets that are built for owner drivers on behalf of Waste Management NZ and are expected to be sold within a year.
- Containers purchased by Waste Management NZ specifically for resale to councils that are expected to be sold within a year.

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17 SHAREHOLDER'S EQUITY

	Number 2020	Number 2019	Value 2020 $000	Value 2019 $000
Shares issued and fully paid up				
209,987,539 ordinary shares @ $1 each	**209,987,540**	209,987,540	**209,988**	209,988
Balance as at 31 December	**209,987,540**	209,987,540	**209,988**	209,988

		Group 2020 $000	Group 2019 $000
Retained Earnings			
Balance as at beginning of year		**86,049**	63,474
Net surplus/ (deficit) for the year		**(258)**	16,901
Transfer from capital notes reserve	18	**4,589**	5,674
Balance as at 31 December		**90,380**	86,049

18 RESERVES

		Group 2020 $000	Group 2019 $000
Hedging reserve			
Balance as at beginning of year		**(4,324)**	-
Total recognised income and expenses		**729**	(4,324)
Balance as at 31 December		**(3,595)**	(4,324)

The hedging reserve comprises the effective portion of the cumulative net change in the fair value of cash flow hedging instruments related to hedged transactions that have not yet impacted on Statement of Profit or Loss.

Capital note reserve			
Balance as at beginning of year		**10,851**	16,525
Total recognised income and expenses	17	**(4,589)**	(5,674)
Balance as at 31 December		**6,262**	10,851

The capital note reserve comprises the equity component of the $150,000,000 of capital notes issued on 27 June 2014 to BCG NZ Investment Holding Limited. The capital notes have been split into debt and equity components based on the net present value of the expected interest free notes over their life using a rate of 8.80% per annum. Initially the reserve recognised on borrowings was $44,928,762 which includes recognition of a deferred tax liability on the balance with an equity component on the capital notes of $62,401,058 offset by a deferred tax liability of $17,472,296.

Total reserve balance as at 31 December		**2,667**	6,527

19 INTEREST-BEARING LOANS AND BORROWINGS

	NOTES	Group 2020 $000	Group 2019 $000
Non-current liabilities			
Loans from related parties	25	**130,098**	750,341
		130,098	750,341
Current liabilities			
Loans from related parties	25	**634,853**	-
Interest bearing loans and borrowings		**30,000**	42,400
		664,853	42,400
Total Liabilities		**794,951**	792,741

Interest bearing loans and borrowings

The Group has a revolving credit facility agreement with the ANZ Bank New Zealand Limited, with a limit of $150,000,000 that has a final expiry date of 31 July 2023.
The current drawndown potions of the available tranche's under the facility are:
- The revolving credit facility $10,000,000 from ANZ Bank New Zealand Limited bears annual interest rate around 1.2900% with a repayment date of 30 April 2021.
- The revolving credit facility $15,200,000 from ANZ Bank New Zealand Limited bears annual interest rate around 1.5500% with a repayment date of 06 January 2021.
- The revolving credit facility $2,200,000 from ANZ Bank New Zealand Limited bears annual interest rate around 1.5500% with a repayment date of 06 January 2021.
- The revolving credit facility $2,600,000 from ANZ Bank New Zealand Limited bears annual interest rate around 1.5500% with a repayment date of 06 January 2021.

Loans from related parties

The Company has a loan facility by way of an agreement dated 18 June 2014 for the ability to draw down funds as required from BCG NZ Investment Holding Limited to a limit of $700,000,000.
This facility expires on 30 June 2024.
The facility has three components:
1 - An unsecured term loan of $450,000,000 with an interest rate of 4.76% plus a margin, with a repayment date of 31 December 2021.
2 - An unsecured working capital facility of $100,000,000 subject to the interest rate of the term loan, with a repayment date of 31 December 2021.
3 - An unsecured subordinated loan of $150,000,000 with an interest rate of 9.36%, with a repayment date of 31 December 2021.

As at 31 December 2020 Beijing Capital Group NZ Investment Holding Limited has drawn down the term loan and subordinated loan totalling $600,000,000 (2019: $600,000,000). Subsequent to the initial draw down, principal of ($78,000,000) has been repaid while $112,852,961 of interest has been capitalised leaving a balance owing of $634,852,691 (2019: $624,355,423).

In addition, Beijing Capital Group Investment Holding Limited has by way of an agreement dated 18 June 2014 issued Capital Notes to BCG NZ Investment Holding Limited on 27 June 2014 to the value of $150,000,000. The final redemption date for these Notes is 30 June 2024.

The capital notes have been split into debt and equity components based on the net present value of the expected cash flows over their life using a rate of 8.80% per annum at the time of recognition. The equity component as at 27 June 2014 was determined to be $62,401,058, with the remaining balance of the $150,000,000 representing the debt component.

During the 31 December 2020 year the expected actual cash flows under the Capital Notes changed as the timing of the triggering of the interest was deferred.
As a result the net present value of the expected cash flows over their life was revalued and ($6,410,914) was released from the debt against the interest expense effective 1 January 2020.

A further $750,840 was recognised in the debt to the interest expense during the year ended 31 December 2020 under the revalued net present value of the expected cash flows over their life.

As at 31 December 2020 the debt component balance of the capital notes was $130,097,595 (2019 $125,985,910). The notes are convertible at the election of the parent based on certain criteria being met. The estimation of the debt and equity component necessarily involves assumptions about when the parent will elect to convert the notes.

The current APA expires 31 December 2021, the Group is currently in the process of accessing the options to replace this agreement with the Inland Revenue. The underlying facility terms and conditions will be revised as part of the process and agreed between the lender and borrower as part of the agreement sign off with the Inland Revenue.

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20 PROVISIONS

Closure and post-closure provisions
Provision is made for the future costs of closing the Group's landfills at the end of their economic or consented lives and for the associated post-closure costs, being the aftercare of the landfills for the prescribed periods. Estimated costs, adjusted for inflation, are built up on an item by item basis. The provision held at each balance date, represents the net present value of the estimated future costs. A detailed reassessment of these costs and the anticipated remaining lives of the landfills is performed regularly.

The impact of changes to the provision arising from the reassessment of the lives of the landfills and estimated future costs are capitalised to deferred closure and post-closure costs within property, plant and equipment in the statement of Financial Position. The annual change in the net present value of the provision due to the passage of time is recorded as the time value adjustment of provisions in the Statement of Comprehensive Income. The financial reporting standards require this to be disclosed as an interest cost in the Statement of Comprehensive Income.

	Group 2020 $000	Group 2019 $000
Balance as at beginning of year	**47,599**	47,195
Reversal of unutilised amounts	**-**	(516)
Reassessment of closure and post-closure provision	**6,830**	591
Effect of time value adjustment	**464**	1,000
Provision utilised	**(707)**	(671)
Balance as at 31 December	**54,186**	47,599

21 TRADE AND OTHER PAYABLES

Current creditors	NOTES	Group 2020 $000	Group 2019 $000
Trade creditors			
- related parties	25	**1,012**	660
- non related parties		**25,029**	25,985
Goods and Services Tax payable		**4,621**	3,285
Other creditors and accruals		**28,421**	26,794
Total trade and other payables as at 31 December		**59,083**	56,724

22 OPERATING LEASES
The Group leases its equipment under operating lease arrangements, with leases negotiated for terms of one to two years.
At 31 December 2020, the Group had total future minimum lease receivables under non-cancellable operating leases with its tenants falling due as follows:

	Group 2020 $000	Group 2019 $000
Not later than one year	**418**	410
Later than one year and not later than five years	**290**	415
Total lease commitments as at 31 December	**708**	825

During the year, no contingent rentals receivable was recognised by the Group (2019: Nil).

23 CAPITAL COMMITMENTS

	Group 2020 $000	Group 2019 $000
Contracted capital expenditure at 31 December	**14,905**	23,818
Total capital commitments as at 31 December	**14,905**	23,818

24 CONTINGENCIES

	Group 2020 $000	Group 2019 $000
Obligations arising from performance bonds and guarantees given in respect of:		
Redvale Landfill	**29,662**	29,432
Tirohia Landfill	**5,485**	5,485
Whitford Landfill	**7,994**	7,614
Kate Valley Landfill	**7,900**	7,900
Bonny Glenn Landfill	**2,673**	500
Local authority waste collection contracts and other activities	**26,599**	24,993
Total contingent liabilities as at 31 December	**80,313**	75,924

Contingencies include the Group's share of associate companies contingencies.
The directors are of the opinion that none of these obligations will eventuate.

At balance date, the Taxation Authority in New Zealand continues its reviews of the Group's tax position. The reviews are ongoing and at this time it is too early to identify the adjustments that may arise, if any.

The Ministry for Business and Innovation have identified irregularities with Waste Management's compliance with the Holiday Pay Act 2003. At year end, progress has been made with consultants engaged to assess impact of any non-compliance and negotiate an enforceable undertaking with the Ministry to remediate the irregularities. At this stage a provision has been made for the costs of this process and the high level estimate of the potential liability. Due to the complexity of the calculations and judgments required, management are not able to reliably measure the full potential impact to any level of detail.

There are no other known contingent liabilities in existence subsequent to balance date.

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25 RELATED PARTY DISCLOSURES

Identity of related parties
The immediate parent of the Group is BCG NZ Investment Holding Limited based in Hong Kong. The Group has a related party relationship with its subsidiaries (see Note 9), associates (see Note 10), joint venture (see Note 11) and with its Directors and Executive Officers. The ultimate parent of the Group is Beijing Capital Group Co., Limited which is ultimately controlled by the State-owned Assets Supervision and Administration Commission of the Chinese Government.

	NOTES	Group 2020 $000	Group 2019 $000
The following trade receivables were owed to the Group by related parties at balance date:			
Waste Disposal Services [1]		**102**	80
Pikes Point Transfer Station Limited [2]		**158**	-
Midwest Disposal Limited [3]		**20**	156
Transwaste Canterbury Limited [4]		**2,879**	-
	15	**3,158**	236
The following revenue was earned from related parties during the year:			
Waste Disposal Services [1]		**949**	1,254
Pikes Point Transfer Station Limited [2]		**2,333**	2,501
Midwest Disposal Limited [3]		**1,322**	1,695
Transwaste Canterbury Limited [4]		**26,481**	23,178
Burwood Resource Recovery Park Limited [5]		**1,993**	1,525
		33,078	30,154
The following trade payables were owed by the Group to related parties at balance date:			
Waste Disposal Services [1]		**(992)**	(417)
Pikes Point Transfer Station Limited [2]		**(21)**	(26)
Midwest Disposal Limited [3]		**-**	-
Transwaste Canterbury Limited [4]		**-**	(217)
	21	**(1,012)**	(660)
The following charges from related parties were incurred during the year:			
Waste Disposal Services [1]		**(3,731)**	(3,285)
Pikes Point Transfer Station Limited [2]		**(2,912)**	(3,596)
Midwest Disposal Limited [3]		**(8,013)**	(8,199)
Transwaste Canterbury Limited [4]		**(8,408)**	(7,209)
Burwood Resource Recovery Park Limited [5]		**-**	(39)
Daniels Sharpsmart New Zealand Limited [7]		**(867)**	(882)
		(23,931)	(23,208)
Current Loans from related parties:			
BCG NZ Investment Holding Limited		**(2,166)**	**-**
BCG NZ Investment Holding Limited - Interest Bearing	19	**(634,853)**	**-**
		(637,019)	-
Non Current Loans from related parties:			
BCG NZ Investment Holding Limited - Capital Notes	19	**(130,098)**	(125,986)
BCG NZ Investment Holding Limited - Interest Bearing	19	**-**	(624,355)
		(130,099)	(750,341)
The following interest was charged by related parties during the financial year:			
BCG NZ Investment Holding Limited	5	**(65,496)**	(62,107)
		(65,496)	(62,107)

[1] Waste Disposal Services is an unincorporated joint venture with Auckland Council Property Ltd
[2] Pikes Point Transfer Station Ltd is 50% owned with Envirocare Ltd
[3] Midwest Disposal Ltd is 50% owned with Enviro Waste Services Ltd
[4] Transwaste Canterbury Ltd is 50% owned with 5 other territorial local authorities(amalgamated during 2020.)
[5] Burwood Resource Recovery Park Ltd is 100% owned by Transwaste Canterbury Ltd
[6] Tiromoana Station Ltd is 100% owned by Transwaste Canterbury Ltd (Amalgamated during 2020)
[7] Daniels Sharpsmart New Zealand Ltd is 50% owed with SteriHealth Pty Ltd

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26 FINANCIAL INSTRUMENTS

		Group 2020 $000	Group 2019 $000
Fair Value of hedging instruments held:			
Forward commodity contracts	Non-current	**(133)**	(2,166)
	Current	**(5,255)**	(4,287)
		(5,388)	(6,453)

Derivative financial instruments are used by the Group in the normal course of business in order to hedge exposure to fluctuations in interest, foreign currency rates and movements in electricity prices.

Electricity price swaps are designated as hedging instruments in cash flow hedges of forecast sales in electricity price.
These forecast transactions are highly probable, and the swaps are being used to hedge the electricity price exposure of fixed price range from 60.25 to 83.39 with notional amount of $11,461,764.60.

There is an economic relationship between the hedged item and the hedging instrument as the terms of the swaps match the terms of the expected highly probable forecast transactions.
The Group established a hedge ratio of the hedging relationship is the same as the resulting from the quantity of the hedged item.
To measure the hedge effectiveness, the Group compares the changes in the fair value of the hedging instruments against the changes in fair value of the hedged items attributable to the hedged risks.

Hedging ineffectiveness can arise from:
Changes to the forecasted amounts of cash flows of hedged items and hedging instruments

The Group holds the following electricity price swaps:

	Maturity: less than 3 months	3-6 months	6- 9 months	9-12 months	1-2 years	2-5 years	Total
As at 31 December 2020							
Electricity price swap (highly probable forecast sales)							
Notional amount ($000)	2,713	3,054	3,028	2,223	444	-	11,462
Fixed Price ($)	68.63 - 83.39	70 - 80	70 - 80	60.25 - 80	70 - 80	0 - 0	

The impacts of the hedging instruments on the statement of financial position are as follows:

As at 31 December 2020	Notional amount $000	Carrying amount $000	Line item in the statement of financial positon	Change in fair value used for measuring hedge ineffectiveness for the year $000
Electricity price swap	11,462	5,388	Derivative financial instruments (liabilities)	(2,253)

As at 31 December 2020	Change in fair value used for measuring hedge ineffectiveness for the year $000	Cash flow hedge reserve $000
Highly probable forecast sales	(2,253)	729

The effects of the cash flow hedge on the statement of profit or loss and the statement of comprehensive income are as follows:

	Total hedging gain/(loss) recognised in OCI			Change in fair value used for measuring hedge ineffectiveness for the year	Line item in the statement of P&L
	Gross amount	Tax effect	Total		
As at 31 December 2020					
Highly probable forecast sales	(2,253)	631	(1,622)	-	Other expenses

	Amount reclassified from OCI to P&L			Line item (gross amount) in the statement of P&L
	Gross amount	Tax effect	Total	
As at 31 December 2020				
Highly probable forecast sales	3,265	(914)	2,351	Other expenses

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27 LEASES

The Group as a lessee
The Group has lease contracts for various items of land and buildings, plant and machinery and motor vehicles used in its operations. Leases of land and buildings and plant and machinery generally have lease terms between 1 and 52 years while motor vehicles generally have lease terms between 1 and 5 years. Generally, the Group is restricted from assigning and subleasing the leased assets outside the Group.

(a) Right-of-use assets
The carrying amounts of the Group's right-of-use assets and the movements during the year are as follows:

	Land and buildings NZ$	Plant and machinery NZ$	Motor vehicles NZ$	Total NZ$
As at 1 January 2020	259,033	180	3,487	**262,700**
Additions	25,179	-	1,017	**26,196**
Depreciation charge	(7,844)	(49)	(1,466)	**(9,359)**
Revision of a lease term arising from a change in the non-cancellable period of a lease	(1,132)	-	-	**(1,132)**
As at 31 December 2020	**275,236**	**131**	**3,038**	**278,405**
As at 1 January 2019	56,194	29	2,053	**58,276**
Additions	211,584	197	2,712	**214,493**
Depreciation charge	(7,569)	(46)	(1,248)	**(8,863)**
Revision of a lease term arising from a change in the non-cancellable period of a lease	(1,176)	-	(30)	**(1,206)**
As at 31 December 2019	**259,033**	**180**	**3,487**	**262,700**

Included in land and buildings is a property lease for a site located in Auckland, New Zealand. The property is occupied by Waste Management NZ Limited and serves as its national head office. The property is purpose-built in order to facilitate the long-term needs of the business. The lease agreement has an initial, non-cancellable lease period of 25 years which commenced on 22 December 2019. Subsequently, the lease agreement includes one right of renewal of ten years followed by seven rights of renewals of eight years each. The final expiry date is 21 December 2110.

(b) Lease liabilities
The carrying amount of lease liabilities and the movements during the year are as follows:

	Group 2020 $000	Group 2019 $000
Carrying amount at 1 January 2020	262,419	58,275
New leases	26,449	212,548
Interest expense	12,381	2,879
Payments:		
- Principle portion of Lease	(5,715)	(7,179)
- Interest paid	(5,762)	(2,879)
Others	(1,166)	(1,225)
Carrying amount at 31 December 2020	**288,606**	**262,419**
Analysed into:	11,585	11,164
Current portion	277,021	251,255
Non-current portion	**288,606**	**262,419**

28 SUBSEQUENT EVENTS

There were no material events subsequent to balance date that would affect the interpretation of the Financial Statements or the financial performance of Beijing Capital Group NZ Investment Holding Limited and its subsidiaries as at 31 December 2020 (2019: Nil).

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Independent auditor's report to the Shareholder of Beijing Capital Group NZ Investment Holding Limited

Report on the audit of the financial statements

Opinion

We have audited the financial statements of Beijing Capital Group NZ Investment Holding Limited ("the Company") and its subsidiaries (together "the Group") on pages 5 to 25, which comprise the consolidated statement of financial position of the Group as at 31 December 2020, the consolidated statement of comprehensive income, consolidated statement of changes in equity and consolidated statement of cash flows for the year then ended of the Group, and the notes to the consolidated financial statements including a summary of significant accounting policies.

In our opinion, the consolidated financial statements on pages 5 to 25 present fairly, in all material respects, the consolidated financial position of the Group as at 31 December 2020 and its consolidated financial performance and cash flows for the year then ended in accordance with New Zealand equivalents to International Financial Reporting Standards Reduced Disclosure Regime.

This report is made solely to the Company's shareholder. Our audit has been undertaken so that we might state to the Company's shareholder those matters we are required to state to them in an auditor's report and for no other purpose. To the fullest extent permitted by law, we do not accept or assume responsibility to anyone other than the Company and the Company's shareholder, for our audit work, for this report, or for the opinions we have formed.

Basis for opinion

We conducted our audit in accordance with International Standards on Auditing (New Zealand). Our responsibilities under those standards are further described in the *Auditor's Responsibilities for the Audit of the Financial Statements* section of our report.

We are independent of the Group in accordance with Professional and Ethical Standard 1 (revised) Code of Ethics for Assurance Practitioners issued by the New Zealand Auditing and Assurance Standards Board, and we have fulfilled our other ethical responsibilities in accordance with these requirements.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our opinion.

Ernst & Young provides taxation compliance services, taxation advisory services and technology advisory services to the Group. Partners and employees of our firm may deal with the Group on normal terms within the ordinary course of trading activities of the business of the Group. We have no other relationship with, or interest in, the Group.

Information other than the financial statements and auditor's report

The directors of the Company are responsible for the Annual Report, which includes information other than the consolidated financial statements and auditor's report.

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Our opinion on the consolidated financial statements does not cover the other information and we do not express any form of assurance conclusion thereon.

In connection with our audit of the consolidated financial statements, our responsibility is to read the other information and, in doing so, consider whether the other information is materially inconsistent with the consolidated financial statements or our knowledge obtained during the audit, or otherwise appears to be materially misstated.

Directors' responsibilities for the financial statements

The directors are responsible, on behalf of the Company, for the preparation and fair presentation of the consolidated financial statements in accordance with New Zealand equivalents to International Financial Reporting Standards Reduced Disclosure Regime, and for such internal control as the directors determine is necessary to enable the preparation of consolidated financial statements that are free from material misstatement, whether due to fraud or error.

In preparing the consolidated financial statements, the directors are responsible for assessing on behalf of the entity the Group's ability to continue as a going concern, disclosing, as applicable, matters related to going concern and using the going concern basis of accounting unless the directors either intend to liquidate the Group or cease operations, or have no realistic alternative but to do so.

Auditor's responsibilities for the audit of the financial statements

Our objectives are to obtain reasonable assurance about whether the consolidated financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes our opinion. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with International Standards on Auditing (New Zealand) will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of these consolidated financial statements.

A further description of our responsibilities for the audit of the consolidated financial statements is located at the External Reporting Board website: https://www.xrb.govt.nz/standards-for-assurance-practitioners/auditors-responsibilities/audit-report-7. This description forms part of our auditor's report.

Ernst & Young

Chartered Accountants
Auckland
9 April 2021

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BEIJING CAPITAL GROUP NZ INVESTMENT HOLDING LIMITED
AND SUBSIDIARIES

ANNUAL REPORT AND FINANCIAL STATEMENTS

FOR THE YEAR ENDED 31 DECEMBER 2019

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COMPANY DIRECTORY

Nature of Business	Company: Group:	Holding Company Waste Management Services
Company Number	5102401	
Registered Office	318 East Tamaki Road East Tamaki Auckland	
Directors	s7(2)(a) [redacted]	(Resigned 11 March 2020) (Appointed 06 April 2020)
Shareholder	BCG NZ Investment Holding Limited	209,987,540 Shares
Auditor	Ernst & Young PO Box 2146 Auckland 1140	
Banker	Bank of New Zealand ANZ Bank HSBC Bank	
Solicitors	Brown Partners Lawyers Russell McVeagh	
Business Location	East Tamaki Auckland	

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ANNUAL REPORT
For the year ended 31 December 2019

The Board of Directors present their Annual Report including Financial Statements of the Group for the year ended 31 December 2019.

Annual Report Disclosures

A unanimous resolution was passed by the company pursuant to subsection 211(3) of the Companies Act 1993, that this annual report need not comply with paragraphs (a) and (e) to (j) of subsection 211(1) of the Act.

For and on behalf of the Board:

Director s7(2)(a) Date 20 April 2020

Director s7(2)(a) Date

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CONSOLIDATED STATEMENT OF PROFIT OR LOSS AND OTHER COMPREHENSIVE INCOME

For the year ended 31 December 2019

	NOTES	Group 2019 $000	Group 2018 $000
Rendering of Services		**519,739**	504,832
Revenue	2	**519,739**	504,832
Other operating income	2	**2,360**	388
Subcontractor expenses		**(69,100)**	(65,438)
Disposal expenses		**(76,107)**	(76,555)
Employee expenses	4	**(119,353)**	(116,685)
Vehicle, plant and machinery operating expenses		**(50,059)**	(54,899)
Other operating expenses		**(53,012)**	(48,786)
Selling & administration expenses		**(9,773)**	(11,209)
Operating profit before financing, impairment, depreciation, associates and tax		**144,695**	131,648
Depreciation expense	7, 27	**(57,043)**	(45,112)
Amortisation expense	8	**(11,437)**	(10,790)
Operating profit / (loss) before financing, associates and tax		**76,215**	75,746
Net financing expenses	5	**(67,198)**	(70,120)
Share of profit of associates	10	**8,991**	8,593
Profit / (Loss) before tax		**18,008**	14,219
Income tax credit / (expense)	6	**(1,107)**	(2,227)
Net profit / (loss) for the year		**16,901**	11,992
Profit for the year from continuing operations		**16,901**	11,992
Profit for the year attributable to:			
Equity holders of the Parent		**16,901**	11,992
Other comprehensive income			
Revaluation of hedge contracts	18	**(4,324)**	-
Other comprehensive income for the year		**(4,324)**	-
Total comprehensive income for the year		**12,577**	11,992
Total comprehensive income for the year attributable to:			
Equity holders of the Parent		**12,577**	11,992
		12,577	11,992

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CONSOLIDATED STATEMENT OF CHANGES IN EQUITY

For the year ended 31 December 2019

GROUP		Attributable to the equity holders of the parent				
		Share capital $000	Hedging reserves $000	Capital note reserve $000	Retained earnings $000	Total equity $000
Opening Balance - 1 January 2018		209,988	-	23,196	44,811	277,995
Net profit / (loss) for the period	17, 18	-	-	(6,671)	18,663	11,992
Other comprehensive income	18	-	-	-	-	-
Total comprehensive income for the period		-	-	(6,671)	18,663	11,992
Transactions with owners, recorded directly in equity						
Dividends to shareholders	17	-	-	-	-	-
		-	-	-	-	-
Closing Balance - 31 December 2018		209,988	-	16,525	63,474	289,987

GROUP		**Share capital $000**	**Hedging reserves $000**	**Capital note reserve $000**	**Retained earnings $000**	**Total equity $000**
Opening Balance - 1 January 2019		**209,988**	**-**	**16,525**	**63,474**	**289,987**
Net profit / (loss) for the year	17, 18	**-**	**-**	**(5,674)**	**22,575**	**16,901**
Other comprehensive income	18	**-**	**(4,324)**	**-**	**-**	**(4,324)**
Total comprehensive income for the year		**-**	**(4,324)**	**(5,674)**	**22,575**	**12,577**
Transactions with owners, recorded directly in equity						
Dividends to shareholders	17	**-**	**-**	**-**	**-**	**-**
		-	**-**	**-**	**-**	**-**
Closing Balance - 31 December 2019		**209,988**	**(4,324)**	**10,851**	**86,049**	**302,564**

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CONSOLIDATED STATEMENT OF FINANCIAL POSITION

As at 31 December 2019

	NOTES	Group 2019 $000	Group 2018 $000
ASSETS			
Non current assets			
Investment in associates	10	**96,134**	99,493
Property, plant and equipment	7	**398,262**	363,502
Right of use assets	27	**262,700**	-
Intangible assets	8	**729,026**	740,463
Emission units		**9,168**	6,134
		1,495,290	1,209,592
Current assets			
Trade and other receivables	15	**80,310**	81,263
Prepayments		**4,514**	5,647
Inventory	14	**2,430**	2,803
Property held for resale	16	**2,060**	4,799
Taxation refund		**1,141**	4,110
		90,455	98,622
TOTAL ASSETS		**1,585,745**	1,308,214
EQUITY			
Share capital	17	**209,988**	209,988
Reserves	18	**6,527**	16,525
Retained earnings	17	**86,049**	63,474
Equity Attributable to equity holders of the Parent		**302,564**	289,987
TOTAL EQUITY		**302,564**	289,987
LIABILITIES			
Non current liabilities			
Closure and post closure provisions	20	**47,599**	47,195
Lease liabilities	27	**251,255**	-
Derivative financial instruments - financial liabilities	26	**2,166**	113
Deferred taxation	12	**81,867**	87,838
Loans from related parties	19	**750,341**	739,791
		1,133,228	874,937
Current liabilities			
Cash and cash equivalents	13	**5,000**	8,336
Interest bearing loans and borrowings	19	**42,400**	40,200
Trade and other payables	21	**56,724**	64,129
Provisions		**11,596**	10,251
Revenue received in advance		**18,782**	19,233
Lease liabilities	27	**11,164**	-
Derivative financial instruments - financial liabilities	26	**4,287**	1,141
		149,953	143,290
TOTAL LIABILITIES		**1,283,181**	1,018,227
TOTAL EQUITY AND LIABILITIES		**1,585,745**	1,308,214

This statement should be read in conjunction with the notes to the financial statements which are included on pages 9-26

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CONSOLIDATED STATEMENT OF CASH FLOWS

For the year ended 31 December 2019

	NOTES	Group 2019 $000	Group 2018 $000
Cash Flows from Operating Activities			
Profit Before Tax		**18,008**	14,219
Adjustments for:			
Depreciation of;			
- Fixed Assets	7	**48,180**	45,112
- Right of Use Assets	27	**8,863**	-
Amortisation and Impairment of Intangible Assets	8	**11,437**	10,790
Loss/(Gain) on sale of property, plant and equipment	3	**(37)**	(1,366)
Fair value adjustment of contingent consideration	2	**(1,000)**	-
Share of profit of associates	10	**(8,991)**	(8,593)
Impairment loss on trade receivables	3	**49**	759
Net financing expenses	5	**67,198**	70,120
		143,707	131,041
(Increase)/Decrease in Inventories	14	**373**	(266)
(Increase)/Decrease in Prepayments		**(812)**	(856)
(Increase)/Decrease in Operating Receivables		**904**	(15,222)
(Increase)/Decrease in Property held for resale	16	**2,739**	(2,732)
Decrease/(Increase) in Investment in associates		**-**	(200)
(Increase)/Decrease in Emission units		**4,441**	3,401
(Decrease)/Increase in Operating Payables		**(17,211)**	(7,876)
(Decrease)/Increase in Provisions		**1,345**	(3,840)
(Decrease)/Increase in Revenue received in advance		**(451)**	(1,194)
(Decrease)/Increase in Derivative financial instruments	26	**(807)**	880
(Decrease)/Increase in Lease liabilities		**(19)**	-
Decrease in Closure and post closure provisions	20	**(1,186)**	(915)
		133,023	102,221
Interest Paid		**(1,548)**	(1,661)
Interest Received		**275**	83
NRWT Paid		**(5,677)**	(5,468)
Emissions Units Acquired		**(7,474)**	(626)
Taxes Paid		**(2,430)**	(7,602)
Net Cash Flows from Operations		**116,169**	86,947
Cash Flows from Investing Activities			
Proceeds from sale of property, plant and equipment		**656**	2,402
Purchases of items of property, plant and equipment	7	**(72,347)**	(78,536)
Dividends from associates	10	**12,350**	9,450
Net cash flows used in investing activities		**(59,341)**	(66,684)
Cash Flows from Financing Activities			
New Bank Loans		**2,200**	7,200
Intercompany Loan paid		**(11,999)**	(12,000)
Interest paid		**(36,514)**	(33,390)
Principal portion of lease payment / finance lease rental payments		**(7,179)**	-
Net Cashflows (used in)/from financing activities		**(53,492)**	(38,190)
Closing Balance of Cash on Hand		**(5,000)**	(8,336)
Minus: Opening Balance of Cash		**(8,336)**	9,592
Net Increase/(Decrease) of Cash and Cash Equivalents		**3,336**	(17,928)

RELEASED UNDER THE LOCAL GOVERNMENT AND MEETINGS ACT 1987

NOTES TO THE CONSOLIDATED FINANCIAL STATEMENTS
For the year ended 31 December 2019

1 SIGNIFICANT ACCOUNTING POLICIES AND ACCOUNTING JUDGEMENTS

Reporting Entity

Beijing Capital Group NZ Investment Holding Limited (the "Company") is a limited liability company incorporated and domiciled in New Zealand.

The Company, its subsidiaries, associates, and joint ventures comprise the Beijing Capital Group NZ Investment Holding Group (the "Group"). The immediate parent of the Group is BCG NZ Investment Holding Limited based in Hong Kong. The ultimate parent of the Group is the State-owned Beijing Capital Group Co Limited based in Beijing.

The Company is a holding company and the Group provides waste management services.

The Company was incorporated and registered under the Companies Act 1993 on 20 May 2014.

The Financial Statements of the Group are for the year ended 31 December 2019.

Statement of Compliance

The consolidated financial statements of the group comply with New Zealand Equivalents to International Financial Reporting Standards Reduced Disclosure Regime (NZ IFRS RDR).

Basis of Preparation

These general purpose financial reports have been prepared in accordance with New Zealand Generally Accepted Accounting Practice (NZ GAAP). For the purposes of complying with NZ GAAP the entity is a for-profit-entity.

The Group is a Tier 2 for-profit entity and has elected to report in accordance with Tier 2 For-Profit Accounting Standards. The Group is eligible to report in accordance with Tier 2 For-Profit Accounting Standards on the basis that it does not have public accountability and is not a large-for-profit public sector entity

The Financial Statements comprise the Consolidated Financial Statements of the Group.

The Company is a reporting entity for the purposes of the Financial Reporting Act 2013 and its Financial Statements comply with that Act.

Basis of Measurement

The Financial Statements are prepared on the historical cost basis except that the following assets and liabilities are stated at their fair value: forward commodity contracts. These Financial Statements are presented in New Zealand dollars ("NZD") and all value are rounded to the nearest thousand ($000), except when otherwise stated.

Significant Accounting Policies

The accounting policies set out below have been consistently applied to all periods presented in these Financial Statements.

Changes in Accounting Policies

The Group has adopted the following new and revised NZ IFRSs for the first time in the current year's financial statements, which are applicable to the Group.
- NZ IFRS 16 Leases

Other amendments and interpretations apply for the first time in 2019, but do not have an impact on the consolidated financial statements of the Group. The Group has not early adopted any standards, interpretations or amendments that have been issued but are not yet effective.

The nature and effect of the changes as a result of adoption of these new accounting standards are described below.

NZ IFRS 16 Leases

NZ IFRS 16 supersedes NZ IAS 17 Leases, NZ IFRIC 4 Determining whether an Arrangement contains a Lease, NZ SIC-15 Operating Leases-Incentives and NZ SIC-27 Evaluating the Substance of Transactions Involving the Legal Form of a Lease. The standard sets out the principles for the recognition, measurement, presentation and disclosure of leases and requires lessees to recognise most leases on the balance sheet.

Lessor accounting under NZ IFRS 16 is substantially unchanged from NZ IAS 17. Lessors will continue to classify leases as either operating or finance leases using similar principles as in NZ IAS 17. Therefore, NZ IFRS 16 does not have an impact for leases where the Group is the lessor.

The Group adopted NZ IFRS 16 using the modified retrospective method of adoption, with the date of initial application of 1 January 2019. Under this method, the standard has been applied retrospectively with the cumulative effect of initial adoption recognised as an adjustment to the opening balance of retained profits at 1 January 2019, and the comparative information for 2018 was not restated and continued to be reported under NZ IAS 17, NZ IFRIC 4 and related interpretations. The Group also elected to use the recognition exemptions for lease contracts that, at the commencement date, have a lease term of 12 months or less and do not contain a purchase option (short-term leases),

New definition of a lease

Under NZ IFRS 16, a contract is, or contains a lease if the contract conveys a right to control the use of an identified asset for a period of time in exchange for consideration. Control is conveyed where the customer has both the right to obtain substantially all of the economic benefits from use of the identified asset and the right to direct the use of the identified asset. The Group elected to use the transition practical expedient allowing the standard to be applied only to contracts that were previously identified as leases applying NZ IAS 17 and NZ IFRIC 4 at the date of initial application. Contracts that were not identified as leases under NZ IAS 17 and NZ IFRIC 4 were not reassessed. Therefore, the definition of a lease under NZ IFRS 16 has been applied only to contracts entered into or changed on or after 1 January 2019.

As a lessee – Leases previously classified as operating leases

Nature of the effect of adoption of NZ IFRS 16

The Group has lease contracts for various items of property, machinery, vehicles and other equipment. As a lessee, the Group previously classified leases as operating leases based on the assessment of whether the lease transferred substantially all the rewards and risks of ownership of assets to the Group. Under NZ IFRS 16, the Group applies a single approach to recognise and measure right-of-use assets and lease liabilities for all leases, except for two elective exemptions for leases of low value assets (elected on a lease-by-lease basis) and leases with a lease term of 12 months or less ("short-term leases") (elected by class of underlying asset). Instead of recognising rental expenses under operating leases on a straight-line basis over the lease term commencing from 1 January 2019, the Group recognises depreciation (and impairment, if any) of the right-of-use assets and interest accrued on the outstanding lease liabilities (as finance costs).

Impacts on transition

Lease liabilities at 1 January 2019 were recognised based on the present value of the remaining lease payments, discounted using the incremental borrowing rate at 1 January 2019. The right-of-use assets were measured at the amount of the lease liability, adjusted by the amount of any prepaid or accrued lease payments relating to the lease recognised in the statement of financial position immediately before 1 January 2019.

All these assets were assessed for any impairment based on NZ IAS 36 on that date. The Group elected to present the right-of-use assets separately in the statement of financial position exclude the prepaid land lease payments which is still presented separately in the statement of financial position.

The Group has used the following elective practical expedients when applying NZ IFRS 16 at 1 January 2019:
- Applying the short-term lease exemptions to leases with a lease term that ends within 12 months from the date of initial application
- Using hindsight in determining the lease term where the contract contains options to extend/terminate the lease
- Applying a single discount rate to a portfolio of leases with reasonably similar characteristics when measuring the lease liabilities at 1 January 2019.

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NOTES TO THE CONSOLIDATED FINANCIAL STATEMENTS
For the year ended 31 December 2019

Changes in Accounting Policies (continued - NZ IFRS 16 Leases)

Financial impact at 1 January 2019

Accordingly, the Group recognised right-of-use assets of $58,275,265 and lease liabilities of NZ$58,275,265 at 1 January 2019.

The lease liabilities as at 1 January 2019 reconciled to the operating lease commitments as at 31 December 2018 are as follows:

	Group $000
Operating lease commitments as at 31 December 2018	**33,684**
Add: Payments for optional extension periods not recognised as at 31 December 2018	43,354
	77,038
Weighted average incremental borrowing rate as at 1 January 2019	3.75%
Discounted operating lease commitments at 1 January 2019	58,275
Lease liabilities as at 1 January 2019	**58,275**

Comparative Information
Where appropriate, the comparative items for the 2018 year have been reclassified to conform to the current year's presentation. Such reclassifications did not affect net income or equity.

Basis of Consolidation
The consolidated Financial Statements comprise the Financial Statements of Beijing Capital Group NZ Investment Holding Limited and its subsidiaries as at and for the year ended 31 December 2019. Interests in associates are equity accounted and are not part of the consolidated Group.

Subsidiaries are all those entities over which the Group has the power to govern the financial and operating policies so as to obtain benefits from their activities. The existence and effect of potential voting rights that are currently exercisable or convertible are considered when assessing whether a group controls another entity.

The Financial Statements of the subsidiaries are prepared for the same reporting year as the Parent Company, using consistent accounting policies. In preparing the consolidated Financial Statements, all intercompany balances and transactions, income and expenses, and profits and losses resulting from intra-group transactions have been

Subsidiaries are fully consolidated from the date on which control is obtained by the Group and cease to be consolidated from the date on which control is transferred out of the Group.

The acquisition of subsidiaries is accounted for using the acquisition method of accounting. The acquisition method of accounting involves recognising at acquisition date, separately from goodwill, the identifiable assets acquired, the liabilities assumed and any non-controlling interest in the acquire. The identifiable assets acquired and the liabilities assumed are measured at their acquisition date fair value.

The difference between the above items and the fair value of the consideration (including the fair value of any pre-existing investment in the acquiree) is goodwill or a discount on acquisition.

A change in the ownership interest of a subsidiary that does not result in a loss of control, is accounted for as an equity transaction.

Profit or loss and each component of other comprehensive income are attributed to the owners (equity holders of the Group) and to the non-controlling interest even if that results in the non-controlling interest having a deficit balance.

If the Group loses control over a subsidiary, it:
- Derecognises the assets (including goodwill) and liabilities of the subsidiary;
- Derecognises the carrying amount of any non-controlling interest;
- Derecognises the cumulative foreign currency translation difference, recorded in reserves;
- Recognises the fair value of any consideration received;
- Recognises the fair value of any investment retained;
- Recognises any surplus or deficit in the Statement of Profit or Loss; and
- Reclassifies the parent's share of components previously recognised in other comprehensive income to the Statement of Profit or Loss.

Acquisition or disposal during the year
Where an entity becomes or ceases to be part of the Group during the year, the results of that entity are included in the Group results from the date of acquisition or up to the date of disposal.

Business combinations
Business combinations are accounted for using the acquisition method. The consideration transferred in a business combination shall be measured at fair value, which shall be calculated as the sum of the acquisition date fair values of the assets transferred by the Group, the liabilities incurred by the Group to former owners of the acquiree and the equity issued by the Group, and the amount of any non-controlling interest in the acquiree. For each business combination, the Group measures the non-controlling interest in the acquiree either at fair value or at the proportionate share of the acquiree's identifiable net assets. Acquisition related costs are expensed as incurred.

When the Group acquires a business, it assesses the financial assets and liabilities assumed for appropriate classification and designation in accordance with the contractual terms, economic conditions, the Group's operating or accounting policies and other pertinent conditions as at the acquisition date.

If the business combination is achieved in stages, the acquisition date fair value of the Group's previously held equity interest in the acquiree is remeasured at fair value as at the acquisition date through the Statement of Profit or Loss.

Any contingent consideration to be transferred by the Group will be recognised at fair value at the acquisition date. Subsequent changes to the fair value of the contingent consideration which is deemed to be an asset or liability will be recognised in accordance with NZ IAS 39 in the Statement of Profit or Loss. If the contingent consideration is classified as equity, it shall not be remeasured.

Business combinations of commonly controlled entities
Business combinations involving entities or businesses under common control are those in which all of the combining entities or businesses are ultimately controlled by the same party or parties both before and after the business combination.

Assets and liabilities assumed in business combinations of commonly controlled entities are measured initially at acquisition date at the book value of the acquired entities. Any difference between the cost of acquisition and the book values of the assets and liabilities acquired is recorded directly in equity.

Investment in Associates, Joint Ventures and Joint Operations
An associate is an entity over which the Company has significant influence. Significant influence is the power to participate in the financial and operating policy decisions of the investee, but is not control or joint control those policies.

A joint venture is a type of joint arrangement whereby the parties that have joint control of the arrangement have rights to the net assets of the joint venture. Joint control is the contractually agreed sharing of control of an arrangement, which exists only when decisions about the relevant activities require unanimous consent of the parties sharing

The Group's investments in associates and joint ventures are stated in the consolidated statement of financial position at the Group's share of net assets under the equity method of accounting, less any impairment losses.

The assets, liabilities, revenues and expenses relating to the Group's interest in a joint operation are accounted for in accordance with the applicable reporting standards.

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Foreign Currency Translations
The Financial Statements are presented in NZD, which is the Company's functional and presentation currency. All foreign currency transactions and hedges are translated to NZD at the exchange rates prevailing on the day of the transaction and any gains or losses on settlement are recognised in the Statement of Profit or Loss at the time of settlement. All foreign currency assets and liabilities are converted to NZD at the rate applicable at the date of the Statement of Financial Position.

Revenue
Revenue from the rendering of services is recognised inline with the service agreements or contract terms upon delivery of services to the customer. Revenue from the sale of goods is recognised inline with the service agreements or contract terms upon delivery of goods to the customer.

Revenue from contracts with customers is recognised when the control of goods or services is transferred to the customers, at an amount that reflects the consideration to which the Group expects to be entitled in exchange for those goods or services.

When the consideration in a contract includes a variable amount, the amount of consideration is estimated to be that which the Group will be entitled in exchange for transferring the goods or services to the customer. The variable consideration is estimated at contract inception and constrained until it is highly probable that a significant revenue reversal in the amount of cumulative revenue recognised will not occur when the associated uncertainty with the variable consideration is subsequently resolved.

When the contract contains a financing component which provides the customer a significant benefit of financing the transfer of goods or services to the customer for more than one year, revenue is measured at the present value of the amount receivable, discounted using the discount rate that would be reflected in a separate financing transaction between the Group and the customer at contract inception. When the contract contains a financing component which provides the Group a significant financial benefit for more than one year, revenue recognised under the contract includes the interest expense accreted on the contract liability under the effective interest method. For a contract where the period between the payment by the customer and the transfer of the promised goods or services is one year or less, the transaction price is not adjusted for the effects of a significant financing component, using the practical expedient in NZ IFRS 15.

Contracts for services
Contract revenue on the rendering of services comprises the agreed contract amount. Costs of rendering services comprise labour and other costs of personnel directly engaged in providing the services and attributable overheads.

Contract balances
Contract assets
A contract asset is the right to consideration in exchange for goods or services transferred to the customer. If the Group performs by transferring goods or services to a customer before the customer pays consideration or before payment is due, a contract asset is recognised for the earned consideration that is conditional.

Trade receivables
A receivable represents the Group's right to an amount of consideration that is unconditional (i.e., only the passage of time is required before payment of the consideration is due). Refer to accounting policies of financial assets in section p) Financial instruments – initial recognition and subsequent measurement.

Contract liabilities
A contract liability is the obligation to transfer goods or services to a customer for which the Group has received consideration (or an amount of consideration is due) from the customer. If a customer pays consideration before the Group transfers goods or services to the customer, a contract liability is recognised when the payment is made or the payment is due (whichever is earlier). Contract liabilities are recognised as revenue when the Group performs under the contract.

Other income
Interest income is recognised on an accrual basis using the effective interest method by applying the rate that exactly discounts the estimated future cash receipts over the expected life of the financial instrument or a shorter period, when appropriate, to the net carrying amount of the financial asset.

Dividend income is recognised when the shareholders' right to receive payment has been established, it is probable that the economic benefits associated with the dividend will flow to the Group and the amount of the dividend can be measured reliably.

Goods and Services Tax
All statements are exclusive of Goods and Services Tax ("GST") except receivables and payables which are shown as GST inclusive.

Leases
Lessee (under NZ IAS 17)
The determination of whether an arrangement is, or contains, a lease is based on the substance of the arrangement and requires an assessment of whether the fulfilment of the arrangement is dependent on the use of a specific asset and whether the arrangement conveys a right to use the asset. Finance leases, which transfer to the Group substantially all the rewards and risks incidental to ownership of a leased item, are capitalised at the inception of the lease at the fair value of the leased item, or if lower, at the present value of the minimum lease payments. Lease payments are apportioned between the finance charges and reduction in the lease liability so as to achieve a constant rate of interest on the remaining balance of the liability. Finance charges are expensed through the statement of profit or loss. Capitalised leased assets are depreciated over the shorter of the lease terms and the estimated useful lives of the assets. Operating lease payments, net of any incentives received from the lessor, are recognised as an expense in the statement of profit or loss on a straight-line basis over the lease terms.

Lessee (under NZ IFRS 16)
A contract is, or contains, a lease if the contract conveys a right to control the use of an identified asset for a period of time in exchange for consideration. Control is conveyed where the customer has both the right to obtain substantially all of the economic benefits from use of the identified asset and the right to direct the use of the identified asset. All leases with a term of more than 12 months are recognised as assets representing the right of use of the underlying asset and liabilities representing the obligation to make lease payments, unless the underlying asset is of low value. Both the assets and the liabilities are initially measured on a present value basis. Right-of-use assets are recognised under property, plant and equipment and are measured at cost or valuation less any accumulated depreciation and impairment losses, and adjusted for any remeasurement of the lease liabilities. Right-of-use assets are depreciated on a straight-line basis over the shorter of the useful lives of the assets and the lease terms. Lease liabilities are initially measured at the present value of lease payments to be made under the lease terms and subsequently adjusted by the effect of the interest on and the settlement of the lease liabilities, and the re-measurement arising from any reassessment of the lease liabilities or lease modifications.

Lessor
Where the Group is the lessor, assets leased by the Group are included in non-current assets, and rentals receivable are credited to the statement of profit or loss on the straight-line basis over the lease terms.

Cash and Cash Equivalents
Cash and cash equivalents in the Statement of Financial Position comprise cash at bank and on hand, and short-term deposits with an original maturity of three months or less.

Inventories
Inventories are stated at the lower of cost or net realisable value. Net realisable value is the estimated selling price in the ordinary course of business, less the estimated costs of completion and selling expenses. Costs include the purchase price plus an appropriate proportion of overhead expenditure incurred by the Group. Cost is based on the weighted average cost method and includes expenditure incurred in acquiring the inventories and bringing them to their existing location and condition.

Financial Liabilities
All financial liabilities are recognised initially at fair value and in the case of loans, borrowings and payables net of attributable transaction costs. Subsequent to initial recognition, interest-bearing borrowings are stated at amortised cost with any difference between cost and redemption value being recognised in the Statement of Profit or Loss over the year of the borrowings on an effective interest rate basis.

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Trade and Other Receivables
Trade and other receivables are stated at their cost less impairment losses. Trade and other receivables in overseas currency are converted at the end of year rates of exchange. Any debts considered uncollectable are written off against revenue.

The Group applies the simplified approach to provide for expected credit losses prescribed by NZ IFRS 9, which permits the use of the lifetime expected losses for all trade receivables. To measure the expected credit losses, trade receivables have been grouped based on shared credit risk characteristics. Future cash flows for each group of receivables are estimated on the basis of historical loss experience, adjusted to reflect the effects of current conditions as well as forward looking information. Management has closely monitored the credit qualities and the collectability of the trade receivables. Trade receivables in dispute are assessed individually for impairment to determine whether specific loss allowance provisions are required.

Trade and Other Payables
Trade and other payables are carried at amortised cost and due to their short term nature they are not discounted. They represent liabilities for goods and services provided to the Company prior to the end of the financial year that are unpaid and arise when the Company becomes obliged to make future payments in respect of the purchase of these goods and services. The amounts are unsecured and are usually paid within 30 days of recognition.

Property, Plant and Equipment
Depreciation
Depreciation is provided on a straight line basis on all fixed assets, at rates calculated to allocate the asset cost less estimated residual value, over their useful lives. The estimated useful lives of property, plant and equipment are:

	Life in years
Building and site improvements	15 - 25
Leasehold improvements	3 - 10
Plant, machinery and containers	5 - 15
Vehicles and related equipment	3 - 15
Office equipment, furniture and fittings	3 - 5

The residual value of assets is re-assessed annually.

The depreciation of landfill development costs is based on the total anticipated waste volume of the landfill concerned. The depreciation amount is calculated on that portion of total landfill costs represented by the waste volume consumed for the financial year as compared to the total volume.

Future landfill site restoration and aftercare costs capitalised are depreciated at rates that match the pattern of benefits expected to be derived from the respective sites.

Intangible Assets
Goodwill
Goodwill represents the excess of the cost of an acquisition over the fair value of the Group's share of the net identifiable assets of the acquired business, subsidiary or associate at the date of acquisition. Goodwill on the acquisition of businesses or subsidiaries is included in intangible assets. Goodwill on acquisition of associates is included in investments in associates. Goodwill is not amortised. Instead goodwill is tested for impairment annually or more frequently if events or changes in circumstances indicate that it might be impaired, and is carried at cost less accumulated impairment losses. Gains and losses on the disposal of an entity include the carrying amount of goodwill relating to the entity sold.
Goodwill is allocated to cash-generating units (or groups of cash generating units) for the purpose of impairment testing.

Other Intangibles
Intangible assets acquired separately or in a business combination are initially measured at cost. The cost of an intangible asset acquired in a business combination is its fair value as at the date of acquisition. Following initial recognition, intangible assets are carried at cost less any accumulated amortisation and any accumulated impairment losses. Internally generated intangible assets are not capitalised and expenditure is recognised in the Statement of Profit or Loss in the year in which the expenditure is incurred. The useful lives of intangible assets are determined as either finite or indefinite.
Intangible assets with finite lives are amortised over the useful life and tested for impairment when there is an indication that the intangible asset may be impaired. The amortisation year and the amortisation method for an intangible asset with a finite useful life is reviewed annually. The amortisation expense for intangible assets with finite lives is recognised in the Statement of Profit or Loss in the expense category consistent with the function of the intangible asset.

Intangible assets with indefinite useful lives (other than goodwill) are tested for impairment annually, either individually or at the cash-generating unit level. Such intangibles are not amortised.

Impairment
The carrying amounts of the Company's assets are reviewed at each balance date to determine whether there is any indication of impairment. If any such indication exists, the assets recoverable amount is estimated.

If the estimated recoverable amount of an asset is less than its carrying amount, the asset is written down to its estimated recoverable amount and an impairment loss is recognised in the Statement of Profit or Loss.
Estimated recoverable amount of investments and receivables carried at amortised cost is calculated as the present value of estimated future cash flows, discounted at their original effective interest rate. Receivables with a short duration are not discounted. The estimated recoverable amount of other assets is the greater of their fair value less costs to sell and value in use. Value in use is determined by estimating future cash flows from the use and ultimate disposal of the asset and discounting these to their present value using a pre-tax discount rate that reflects current market rates and the risks specific to the assets.

Emission units
The Group purchases emission units ("EU's") in order to satisfy the obligations in relation to the discharge of methane from the landfills under the Emissions Trading Scheme

EU's purchased are initially measured at cost. Following initial recognition all EU's are carried at cost less any accumulated impairment.

The useful life of EU's are assessed as being a mix of fixed term and indefinite life units and are not amortised.
EU's are tested for impairment annually. When the recoverable amount of EU's is less than the carrying amount, an impairment loss is recognised.

The Group is required to surrender New Zealand Units (NZUs) for their emission obligations under the New Zealand Emissions Trading Scheme. The Group has adopted the net liability/ carrying value approach whereby a provision is recognised for the cost of settlement based on the carrying values of NZUs already held and the cost of buying NZUs when the actual emission obligation exceeds NZUs held by the Group. Where NZUs are purchased from other parties they are recorded at cost. Movements in the carrying value of the emissions liability are recognised in the Statement of Profit or Loss.

Employee Benefits
The liability for employee benefits comprises principally of annual, statutory and long service leave accruals payable at balance date. Annual leave and sick leave are recorded at the undiscounted amount expected to be paid for the entitlement earned. For sick leave, this is based on the unused entitlement accumulated at balance date and expected to be utilised in the future.

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Income Tax

The income tax expense charged to the Statement of Profit or Loss includes both the current year's provision and the income tax effect of:
• Taxable temporary differences, except those arising from initial recognition of goodwill and other assets that are not depreciated; and
• Deductible temporary differences to the extent that it is probable that they will be utilised.

Current tax assets and liabilities for the current and prior years are measured at the amount expected to be recovered from or paid to the taxation authorities based on the current year's taxable income. The tax rates and tax laws used to compute the amount are those that are enacted or subsequently enacted by the reporting date.

Tax effect accounting is applied on a comprehensive basis to all temporary differences using the liability method. A deferred tax asset is only recognised to the extent that it is probable there will be future taxable profit to utilise the temporary differences. Temporary differences arising from transactions, other than business combinations, affecting neither accounting profit nor taxable profit are ignored.

Deferred tax is not recognised on temporary differences associated with investments in subsidiaries because:
• The parent company is able to control the timing of the reversal of the differences; and
• They are not expected to reverse in the foreseeable future.

Deferred income tax assets and liabilities are measured at the tax rates that are expected to apply to the year when the asset is realised or the liability is settled, based on tax rates (and tax laws) that have been enacted or subsequently enacted at the reporting date.

Deferred tax assets are offset only if a legally enforceable right exists to set off current assets against current tax liabilities and the deferred tax assets and liabilities relate to the same taxable entity and authority.

Financial Instruments

Financial instruments are recognised in the Statement of Financial Position when the Company becomes party to a financial contract. They include the following individual classes of assets and liabilities:

Loans and receivables

Bank deposits, bank overdrafts, trade and other receivables, intercompany balances and investments in unlisted debt securities are classified as loans and receivables. All of the above financial instruments are initially recorded at cost and subsequently carried at amortised cost using the effective interest rate method. Due allowance is made for impaired receivables (doubtful debts).

Debt instruments are measured at amortised cost using the effective interest rate method, subject to impairment if the assets are held for the collection of contractual cash flows where those contractual cash flows represent solely payments of principal and interest.

Debt instruments are measured at fair value through other comprehensive income if the assets' contractual cash flows represent solely payments of principal and interest and the assets are held for collection of contractual cash flows and for selling the financial assets. Such financial assets are subsequently measured at fair value with any gains or losses from changes in fair value recognised in other comprehensive income, except for impairment losses and reversal, foreign exchange gains and losses and interest calculated using the effective interest rate method which are recognised in the statement of profit or loss. The cumulative gains or losses previously recognised in other comprehensive income are reclassified from other comprehensive income to the statement of profit or loss when the financial asset is derecognised.

Debt instruments that do not meet the criteria for amortised cost or as financial assets at fair value though other comprehensive income are measured at fair value through profit or loss. Interest income for these financial assets is included in finance income.

Equity investments are measured at fair value through profit or loss unless, on initial recognition, the Group has irrevocably elected to designate such investments that are not held for trading as equity investments at fair value through other comprehensive income. Dividends of such investments are recognised in the statement of profit or loss when the Group's right to receive payment is established. Changes in the fair value of such investments are recognised in other comprehensive income and are never recycled to the statement of profit or loss even when the assets are sold.

The Group applies the expected credit loss model on all the financial assets that are subject to impairment, financial guarantee contracts, contract assets under NZ IFRS 15 and lease receivables under NZ IFRS 16. For trade receivables and contract assets without a significant financial component, the Group applies the simplified approach which requires impairment allowances to be measured at lifetime expected credit losses.

For other financial assets, impairment allowances are recognised under the general approach where expected credit losses are recognised in two stages. For credit exposures where there has not been a significant increase in credit risk since initial recognition, the Group is required to provide for credit losses that result from possible default events within the next 12 months. For those credit exposures where there has been a significant increase in credit risk since initial recognition, a loss allowance is required for credit losses expected over the remaining life of the exposure irrespective of the timing of the default.

The Group considers a default has occurred when a financial asset is more than 90 days past due unless the Group has reasonable and supportable information to demonstrate that a more appropriate default criterion should be applied.

If an available-for-sale financial asset measured at fair value is impaired, an amount comprising the difference between its cost (net of any principal payment and amortisation) and its current fair value, less any impairment loss previously recognised in the statement of profit or loss, is removed from other comprehensive income and recognised in the statement of profit or loss. Impairment losses on equity instruments classified as available for sale are not reversed through the statement of profit or loss. Increases in their fair values after impairment are recognised directly in other comprehensive income. Impairment losses on debt instruments are reversed through the statement of profit or loss, if the increase in the fair value of the instrument can be objectively related to an event occurring after the impairment loss was recognised in the statement of profit or loss.

If there is objective evidence that an impairment loss has been incurred for unquoted equity investments measured at cost less impairment, the amount of the loss is measured as the difference between the asset's carrying amount and the present value of estimated future cash flows discounted at the current market rate of return for a similar financial asset. Impairment losses on these assets are not reversed.

Financial assets are derecognised when the rights to receive cash flows from the assets have expired; or where the Group has transferred its contractual rights to receive the cash flows of the financial assets and has transferred substantially all the risks and rewards of ownership; or where control is not retained.

Derivative financial instruments and hedge accounting

Initial recognition and subsequent measurement

The Group uses derivative financial instruments, such as forward currency contracts and interest rate swaps, to hedge its foreign currency risk and interest rate risk, respectively. Such derivative financial instruments are initially recognised at fair value on the date on which a derivative contract is entered into and are subsequently remeasured at fair value. Derivatives are carried as assets when the fair value is positive and as liabilities when the fair value is negative.

The fair value of commodity purchase contracts that meet the definition of a derivative as defined by NZ IFRS 9 is recognised in the statement of profit or loss as cost of sales. Commodity contracts that are entered into and continue to be held for the purpose of the receipt or delivery of a non-financial item in accordance with the Group's expected purchase, sale or usage requirements are held at cost.

Any gains or losses arising from changes in fair value of derivatives are taken directly to the statement of profit or loss, except for the effective portion of cash flow hedges, which is recognised in other comprehensive income and later reclassified to profit or loss when the hedged item affects profit or loss.

For the purpose of hedge accounting, hedges are classified as:
• fair value hedges when hedging the exposure to changes in the fair value of a recognised asset or liability or an unrecognised firm commitment; or
• cash flow hedges when hedging the exposure to variability in cash flows that is either attributable to a particular risk associated with a recognised asset or liability or a highly probable forecast transaction, or a foreign currency risk in an unrecognised firm commitment; or
• hedges of a net investment in a foreign operation.

At the inception of a hedge relationship, the Group formally designates and documents the hedge relationship to which the Group wishes to apply hedge accounting, the risk management objective and its strategy for undertaking the hedge.

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Financial Instruments (continued - Derivative financial instruments and hedge accounting)

The documentation includes identification of the hedging instrument, the hedged item, the nature of the risk being hedged and how the Group will assess whether the hedging relationship meets the hedge effectiveness requirements (including the analysis of sources of hedge ineffectiveness and how the hedge ratio is determined). A hedging relationship qualifies for hedge accounting if it meets all of the following effectiveness requirements:
• There is “an economic relationship” between the hedged item and the hedging instrument.
• The effect of credit risk does not “dominate the value changes” that result from that economic relationship.
• The hedge ratio of the hedging relationship is the same as that resulting from the quantity of the hedged item that the Group actually hedges and the quantity of the hedging instrument that the Group actually uses to hedge that quantity of hedged item.

Hedges which meet all the qualifying criteria for hedge accounting are accounted for as follows:

Cash flow hedges
The effective portion of the gain or loss on the hedging instrument is recognised directly in other comprehensive income in the cash flow hedge reserve, while any ineffective portion is recognised immediately in the statement of profit or loss. The cash flow hedge reserve is adjusted to the lower of the cumulative gain or loss on the hedging instrument and the cumulative change in fair value of the hedged item.

The amounts accumulated in other comprehensive income are accounted for, depending on the nature of the underlying hedged transaction. If the hedged transaction subsequently results in the recognition of a non-financial item, the amount accumulated in equity is removed from the separate component of equity and included in the initial cost or other carrying amount of the hedged asset or liability. This is not a reclassification adjustment and will not be recognised in other comprehensive income for the period. This also applies where the hedged forecast transaction of a non-financial asset or non-financial liability subsequently becomes a firm commitment to which fair value hedge accounting is applied.

For any other cash flow hedges, the amount accumulated in other comprehensive income is reclassified to the statement of profit or loss as a reclassification adjustment in the same period or periods during which the hedged cash flows affect the statement of profit or loss.

If cash flow hedge accounting is discontinued, the amount that has been accumulated in other comprehensive income must remain in accumulated other comprehensive income if the hedged future cash flows are still expected to occur. Otherwise, the amount will be immediately reclassified to the statement of profit or loss as a reclassification adjustment. After the discontinuation, once the hedged cash flow occurs, any amount remaining in accumulated other comprehensive income is accounted for depending on the nature of the underlying transaction as described above.

If cash flow hedge accounting is discontinued, the amount that has been accumulated in other comprehensive income must remain in accumulated other comprehensive income if the hedged future cash flows are still expected to occur. Otherwise, the amount will be immediately reclassified to the statement of profit or loss as a reclassification adjustment. After the discontinuation, once the hedged cash flow occurs, any amount remaining in accumulated other comprehensive income is accounted for depending on the nature of the underlying transaction as described above.

Fair value hedges
The change in the fair value of a hedging instrument is recognised in the statement of profit or loss as other expenses. The change in the fair value of the hedged item attributable to the risk hedged is recorded as a part of the carrying amount of the hedged item and is also recognised in the statement of profit or loss as other expenses.

For fair value hedges relating to items carried at amortised cost, the adjustment to carrying value is amortised through the statement of profit or loss over the remaining term of the hedge using the effective interest rate method. Effective interest rate amortisation may begin as soon as an adjustment exists and shall begin no later than when the hedged item ceases to be adjusted for changes in its fair value attributable to the risk being hedged. If the hedged item is derecognised, the unamortised fair value is recognised immediately in the statement of profit or loss.

When an unrecognised firm commitment is designated as a hedged item, the subsequent cumulative change in the fair value of the firm commitment attributable to the hedged risk is recognised as an asset or liability with a corresponding gain or loss recognised in the statement of profit or loss. The changes in the fair value of the hedging instrument are also recognised in the statement of profit or loss.

Current versus non-current classification
Derivative instruments that are not designated as effective hedging instruments are classified as current or non-current or separated into current and non-current portions based on an assessment of the facts and circumstances (i.e., the underlying contracted cash flows).

• Where the Group expects to hold a derivative as an economic hedge (and does not apply hedge accounting) for a period beyond 12 months after the end of the reporting period, the derivative is classified as non-current (or separated into current and non-current portions) consistently with the classification of the underlying item.
• Embedded derivatives that are not closely related to the host contract are classified consistently with the cash flows of the host contract.
• Derivative instruments that are designated as, and are effective hedging instruments, are classified consistently with the classification of the underlying hedged item. The derivative instruments are separated into current portions and non-current portions only if a reliable allocation can be made.

Other financial liabilities
Bank loans and finance leases are initially recorded at fair value less attributable transaction costs. Subsequent to initial recognition, borrowings are stated at amortised cost with any difference between cost and redemption value being recognised in the Statement of Profit or Loss over the year of the borrowings on an effective interest rate basis. Borrowing costs are expensed in the year in which they occur. Borrowing costs consist of interest and other costs that an entity incurs in connection with the borrowing of funds.

Provisions
A provision is recognised when the Company has a present legal or constructive obligation as a result of a past event, and it is probable that an outflow of economic benefits will be required to settle the obligation. If the effect is material, provisions are determined by discounting the expected future cash flows at a pre-tax rate that reflects current market rates and, where appropriate, the risks specific to the liability.

Issued Capital
Issued and paid up capital is recognised at the fair value of the consideration received by the Company. Any transaction costs incurred by the Company arising on the issue of capital are recognised directly in equity as a reduction of the share proceeds received.

Capital Management
The Company's capital is its shareholders equity which comprises of ordinary shares issued and paid up, retained earnings and reserves. Equity is represented by net assets. The Company manages its revenues, expenses, assets, liabilities, and general financial dealings prudently. The Company's equity is largely managed as a by-product of managing income, expenses, assets, liabilities, and compliance with budgeting processes and Board of Director instructions. The objective of managing the Company's equity is to ensure the Company effectively achieves it goals and objectives for which it has been established, whilst remaining a going concern.

Closure and Post Closure Costs
A provision for future landfill site restoration and aftercare costs is recognised when the activities giving rise to the need for site restoration and aftercare have commenced. The provision is stated at the present value of the future cash flows expected to be incurred, which increases each year due to the passage of time. Any increase in the provision due to the change in present value is recognised in the Statement of Profit or Loss as a time value adjustment.

Onerous Contracts
A provision for an onerous contract is recognised when the expected benefits to be derived by the Company from a contract are lower than the unavoidable cost of meeting its obligations under the contract.

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Going Concern
No material uncertainties exist at or after balance date, that relate to events or conditions that may cast significant doubt on the Group or Company's ability to continue as a going concern.

Accounting Judgements, Estimates and Assumptions
The preparation of the Group's consolidated financial statements requires management to make judgement, estimates and assumption that affect the reported amounts of revenues, expenses, assets, liabilities, the accompanying disclosures and the disclosure of contingent liabilities. Uncertainty about these assumptions and estimates could result in outcomes that require a material adjustment to the carrying amount of the assets or liabilities in future periods.

Estimation uncertainty
The key assumptions concerning the future and other key sources of estimation uncertainty at the end of the reporting period, that have a significant risk of causing a material adjustment to the carrying amounts of assets and liabilities within the next financial year, are described below.

Impairment of non-current assets other than financial assets (other than goodwill)
The Group assesses whether there are any indicators of impairment for all non-financial and non-current assets at the end of each reporting period. Indefinite life intangible assets are tested for impairment annually and at other times when such an indicator exists. Other non-financial assets are tested for impairment when there are indicators that the carrying amounts may not be recoverable. An impairment exists when the carrying value of an asset or a cash-generating unit exceeds its recoverable amount, which is the higher of its fair value less costs of disposal and its value in use. The calculation of the fair value less costs of disposal is based on available data from binding sales transactions in an arm's length transaction of similar assets or observable market prices less incremental costs for disposing of the asset. When value in use calculations are undertaken, management must estimate the expected future cash flows from the asset or cash-generating unit and choose a suitable discount rate in order to calculate the present value of those cash flows.

Impairment of goodwill
The Group determines whether goodwill is impaired at least on an annual basis. This requires an estimation of the value in use of the cash-generating units to which the goodwill is allocated. Estimating the value in use requires the Group to make an estimate of the expected future cash flows from the cash-generating units and also to choose a suitable discount rate in order to calculate the present value of those cash flows. The carrying amount of goodwill at 31 December 2019 was $441.534 million (2018: $441.534 million). Further details are given in Note 8.

Impairment of trade receivables
The impairment provisions for trade receivables and other receivables are based on assumptions about expected credit losses. The Group uses judgements in making these assumptions and selecting the inputs to the impairment calculation, based on the number of days that an individual receivable is outstanding as well as the Group's historical experience and forward-looking information at the end of each reporting period. Changes in these assumptions and estimates could materially affect the results of the assessment and it may be necessary to make an additional impairment charge to profit or loss. Further details of the trade receivables and other receivables are given in note 15 to the financial statements.

Income tax
When providing for income tax, as a result of certain issues on income tax has yet to be confirmed by the tax authorities, estimation has to be made on the basis of the existing tax laws and regulations and other relevant policies. If the relevant matters of the final tax result is different from the estimation amount, the difference will affect the current income tax.

Estimated useful lives and residual value of fixed assets
When estimating useful lives and residual value of fixed assets, the following factors are considered: innovation and improvement, the products or services market demand related to asset changes which results in the outdated of the technical or commercial, intended use of the assets, physical abrasion, maintenance of assets, the laws about use of assets or similar restrictions. The estimate of useful lives of the relevant assets is based on the Group's experience of using similar assets in a similar condition. The estimated life of the landfill asset is dependent on both the resource consent period and estimated time to reach full capacity of the landfill. If the useful lives and residual value of fixed assets are inconsistent with previous estimates, the depreciation may need to be adjusted. The useful lives and residual value will be reviewed at each year end depending on the situation.

Provisions for site restoration
A provision for future landfill site restoration and aftercare costs is recognised when the activities giving rise to the need for site restoration and aftercare have commenced. Management estimates the present value of the future cash flows expected to be incurred, which increases each period due to the passage of time. Any increase in the provision due to the change in present value is recognised in the Statement of Profit or Loss as a time value adjustment. Management will re-evaluate the estimate at the end of each reporting period.

Future landfill site restoration and aftercare costs provided for are initially capitalised in the statement of financial position. Any change in the provision for future landfill site restoration and aftercare costs arising from a change in estimate of those costs is also recognised in non-current assets in the Statement of Financial Position.

Restoration provision are discounted to present value using a risk free rate published by the New Zealand Treasury Department. Future estimated costs are inflated by using a rate published by the New Zealand Treasury Department.

Adjustments in fair value due to changes in estimated future cash flows or timing assumptions are recorded as a change in both the remediation asset and the liability at the time the change in estimate is made.

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2 REVENUE AND OTHER OPERATING INCOME

	Group 2019 $000	Group 2018 $000
Revenue represents the net sales from collections, landfill, recycling, technical services of waste management.		
An analysis of revenue, other income and gains is as follows:		
Collections	**333,499**	324,399
Landfill	**108,489**	103,573
Recycling	**23,690**	23,072
Technical Services	**53,457**	51,677
Others	**604**	2,111
Total Revenue	**519,739**	504,832
Other income	**1,154**	229
Fair value adjustment of contingent consideration	**1,000**	-
Directors Fees	**100**	100
Management Fees	**14**	14
Dividend income	**13**	11
Net Foreign Exchange Gains/(Losses)	**79**	34
Total other income	**2,360**	388

Revenue from contracts with customers

Performance obligations

Information about the Group's performance obligations is summarised below:

Waste collection, landfill and technical services

The performance obligation is satisfied at the point in time when promised service is rendered to a customer, and payment in advance for waste collection is normally required and payment for landfill and technical services is generally due within 50 days as the term of agreements.

Recycling

The performance obligation is satisfied at the point in time when a promised good or service is transferred to a customer and payment is generally due within 50 days upon the transfer.

3 PROFIT BEFORE TAX

	Group 2019 $000	Group 2018 $000
Included within profit before tax are the following items:		
Loss/(Gain) on sale of property, plant and equipment	**(37)**	(1,366)
Donations	**52**	42
Impairment loss on trade receivables	**49**	759
Minimum lease payments under operating leases in respect of office equipment, properties and vehicles	**-**	16,357
Lease payments not included in the measurement of lease liabilities	**6,355**	-

4 EMPLOYEE EXPENSES

	Group 2019 $000	Group 2018 $000
Wages and salaries	**112,260**	109,317
Other benefits	**7,093**	7,368
Total personnel costs	**119,353**	116,685

5 NET FINANCING EXPENSES

	NOTES	Group 2019 $000	Group 2018 $000
Interest income - other		**(272)**	(82)
Total interest income		**(272)**	(82)
Interest expense:			
- leases		**2,879**	2
- related parties	25	**62,107**	67,475
- other		**1,107**	1,379
Time value adjustment			
- Unwinding of provision	20	**1,000**	1,066
- Performance Bond Fee		**377**	280
Total interest expense		**67,470**	70,202
Net finance expense		**67,198**	70,120

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6 TAXATION EXPENSE

	Group 2019 $000	Group 2018 $000
Income tax expense recognised in the Statement of Profit or Loss		
Current tax expense	**(5,396)**	(6,287)
Deferred tax expense	**4,289**	4,060
Total income tax credit / (expense) in Statement of Profit or Loss	**(1,107)**	(2,227)
Reconciliation of effective tax rate		
Profit / (Loss) before tax	**18,008**	14,220
Income tax using the domestic corporation tax rate	**(5,042)**	(3,982)
Non-taxable income	**1**	-
Non-deductible expenses	**1,621**	(253)
Non-taxable income received from associates	**2,517**	2,407
Adjustment relating to prior period	**(193)**	(402)
Others	**(11)**	3
Total income tax credit / (expense) in Statement of Profit or Loss	**(1,107)**	(2,227)
Income Tax recognised directly in other comprehensive income		
Deferred Tax	**(1,682)**	-
Total Income tax recognised in other comprehensive income	**(1,682)**	

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7 Property Plant and Equipment

	Land	Buildings and Site improvements	Vehicles and related equipment	Plant, machinery & containers	Leasehold	Capital WIP	Landfill development	Total
	$000	$000	$000	$000	$000	$000	$000	$000
Cost								
As at 1 January 2019	36,574	19,969	114,037	171,862	13,849	65,410	105,259	**526,960**
Transfers [1]	1,590	1,395	22,254	34,032	653	(67,843)	7,919	**-**
Additional Landfill Provision	-	-	-	-	-	-	591	**591**
Additions	-	-	-	-	-	72,347	-	**72,347**
Disposal	-	(43)	(6,312)	(6,018)	(1)	-	-	**(12,374)**
Other Movement	-	-	-	-	-	10,621	-	**10,621**
Acquired on acquisition of business	-	-	-	-	-	-	-	**-**
Cost as at 31 December	**38,164**	**21,321**	**129,979**	**199,876**	**14,501**	**80,535**	**113,769**	**598,145**
Accumulated Depreciation								
As at 1 January 2019	-	(7,522)	(45,237)	(71,078)	(2,997)		(36,624)	**(163,458)**
Acquired on acquisition of subsidairies	-	-	-	-	-	-	-	**-**
Depreciation for the year	-	(2,028)	(13,274)	(22,481)	(1,289)	-	(9,108)	**(48,180)**
Disposal	-	15	5,935	5,804	1	-	-	**11,755**
Transfers [1]	-	9	4	162	(175)	-	-	**-**
Other	-	-	-	-	-	-	-	**-**
Accumulated Depreciation as at 31 December	**-**	**(9,526)**	**(52,572)**	**(87,593)**	**(4,460)**	**-**	**(45,732)**	**(199,883)**
Net Book Value								
As at 31 December 2018	**36,574**	**12,447**	**68,800**	**100,784**	**10,852**	**65,410**	**68,635**	**363,502**
As at 31 December 2019	**38,164**	**11,795**	**77,407**	**112,283**	**10,041**	**80,535**	**68,037**	**398,262**

	Land	Buildings and Site improvements	Vehicles and related equipment	Plant, machinery & containers	Leasehold	Capital WIP	Landfill development	Total
	$000	$000	$000	$000	$000	$000	$000	$000
Cost								
As at 1 January 2018	36,574	20,520	97,169	152,253	10,483	61,046	95,947	**473,992**
Transfers [1]	(-)	(209)	21,640	22,613	3,366	(67,066)	6,482	**(13,174)**
Additional Landfill Provision	-	-	-	-	-	-	2,830	**2,830**
Additions	-	-	-	-	-	78,536	-	**78,536**
Disposal	-	(342)	(4,772)	(3,004)	-	-	-	**(8,118)**
Other Movement	-	-	-	-	-	(7,106)	-	**(7,106)**
Acquired on acquisition of business	-	-	-	-	-	-	-	**-**
Cost as at 31 December	**36,574**	**19,969**	**114,037**	**171,862**	**13,849**	**65,410**	**105,259**	**526,960**
Accumulated Depreciation								
As at 1 January 2018	-	(6,333)	(33,045)	(57,814)	(1,236)	-	(26,984)	**(125,412)**
Acquired on acquisition of subsidairies	-	-	-	-	-	-	-	**-**
Depreciation for the year	-	(1,947)	(12,628)	(19,747)	(1,150)	-	(9,640)	**(45,112)**
Disposal	-	249	3,851	2,986	-	-	-	**7,086**
Transfers [1]	-	509	(3,415)	3,497	(611)	-	-	**(20)**
Other	-	-	-	0	-	-	-	**0**
Accumulated Depreciation as at 31 December	**-**	**(7,522)**	**(45,237)**	**(71,078)**	**(2,997)**	**-**	**(36,624)**	**(163,458)**
Net Book Value								
As at 31 December 2017	**36,574**	**14,187**	**64,124**	**94,439**	**9,247**	**61,046**	**68,963**	**348,580**
As at 31 December 2018	**36,574**	**12,447**	**68,800**	**100,784**	**10,852**	**65,410**	**68,635**	**363,502**

[1] Net transfer out value of $Nil (2018: $13,194,000) represents Capital WIP acquired and build in the prior and current periods which on completion was recognised as intangibles. Offset by the capitalisation of a deposit paid in the prior period on a property settled / purchased during the current period.

This includes:

	NOTES	Group 2019 $000	Group 2018 $000
Software recognised as intangible assets	8	-	14,494
Property purchase deposit from prepayments		-	(1,300)
Total Transfers		**-**	**13,194**

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8 INTANGIBLE ASSETS

	NOTES	Group 2019 $000	Group 2018 $000
Goodwill			
Opening Balance as at beginning of year		**441,534**	441,534
Goodwill balance as at 31 December		**441,534**	441,534
Other intangibles - customer contracts & consent costs			
Opening Balance as at beginning of year		**298,929**	295,228
Amortisation of Customer Contracts		**(2,414)**	(2,414)
Amortisation of Resource Consents		**(6,634)**	(6,634)
Amortisation of Build Operate Transfer Facility		**(168)**	(341)
Amortisation of Software		**(2,221)**	(1,401)
Transfer of Software from CWIP	7	**-**	14,494
Disposal of Build Operate Transfer Facility		**-**	(3)
Other intangibles balance as at 31 December		**287,492**	298,929
Total intangibles balance		**729,026**	740,463

Other intangible assets represent customer relationships and contracts recorded at their fair value on acquisition and are amortised over the term of the contracts.

Impairment tests for Intangible assets:
The Group is considered to be one cash generating unit.

This represents the lowest level within the Group at which the goodwill and other intangibles are monitored for internal management purposes.

Key assumptions used for value-in-use calculation:
The recoverable amount of the cash generating unit has been based on value in use calculations.

These calculations use cash flow projections based on actual operating results and financial budgets approved by management.
The cash generating unit's cash flows are forecast over 5 years using a nominal EBITDA average growth rate of 3.80% and a 2.50% terminal rate over perpetuity.
A discount rate of 6.87% has been used in discounting the projected cash flows.
These assumptions have been used for the analysis of the cash generating unit. Management determined the budgeted gross margin based on past performance and its' expectations for the market's development. The growth rates used are consistent with the forecasts included in industry reports. The discount rates used reflect specific risks relating to the relevant segment.

9 INVESTMENT IN SUBSIDIARIES

Investment in subsidiaries
Beijing Capital Group NZ Investment Holding Limited's investment in subsidiaries comprises shares at cost. The significant subsidiaries comprise of:

		Interest held by Group 2019 %	2018 %
Investment in subsidiaries - companies incorporated in New Zealand	**Principal Activities**		
Waste Management NZ Limited	Waste Management Services	**100**	100
Tartan Industries Limited	Property Holding	**100**	100
Waste Care Limited	Name Protection	**100**	100
Waste Disposal Services Limited	Name Protection	**100**	100
Flexi-Bin Limited	Name Protection	**100**	100
Sunshine Garden Bag and Bin Company Limited	Name Protection	**100**	100
Budget Bins Ltd	Name Protection	**100**	100
Waste Management All Brite Limited	Name Protection	**100**	100
Gordies Bags Limited	Name Protection	**100**	100
Gordies Skip Bins Limted	Name Protection	**100**	100
Gordies Bins Limited	Name Protection	**100**	100
Healthcare Waste Limited	Name Protection	**100**	100
Living Earth Limited	Name Protection	**100**	100
Waste Management Limited	Name Protection	**100**	100
The Wheelibin Company Limited	Name Protection	**100**	100
Get-A-Bin Limited	Name Protection	**100**	100
Eastern Bins Limited	Name Protection	**100**	100
Waste Management Collections Limited	Name Protection	**100**	100
BCG Waste Management Limited	Name Protection	**100**	100
Canterbury Waste Services Limited	Name Protection	**100**	100
Recycle New Zealand Limited	Name Protection	**100**	100
Otago Waste Services Limited	Name Protection	**100**	100
Pacific Rubber Recycling Limited	Name Protection	**100**	100
ERS New Zealand Limited	Name Protection	**100**	100
Canterbury Material Recovery Facilities Limited	Name Protection	**100**	100
Waste Management Solutions (NZ) Limited	Name Protection	**100**	100
Waste Services Marlborough Limited	Name Protection	**100**	100
Waste Management Technical Services Limited	Name Protection	**100**	100
Waste Management Recycling Limited	Name Protection	**100**	100

(i) All subsidiaries are New Zealand entities that are direct subsidiaries of the Company and have a 31 December balance date. There are no significant restrictions on the ability of the subsidiary to pay dividends, repay loans or otherwise transfer funds to the Parent.

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10 INVESTMENT IN ASSOCIATES

a) Movements in the carrying amount of the Group's investment in associates

	Group 2019 $000	Group 2018 $000
Balance as at beginning of year	**99,493**	100,150
Divestment / release to Statement of profit or loss	**-**	200
Dividends received	**(12,350)**	(9,450)
Share of profit/(loss)	**9,879**	9,481
Amortisation of identified intangible consent costs	**(888)**	(888)
Balance as at 31 December	**96,134**	99,493

b) Investment details
Summary financial information on associates - 100 per cent

Name	Country of Incorporation	Nature of Business	Assets $000	Liabilities $000	Revenue $000	Profit/ (Loss) $000	% Interest Held
2019							
Midwest Disposals Limited	New Zealand	Landfill Operation & Refuse Transfer Station	**39,546**	**15,676**	**9,886**	**2,993**	50
Pikes Point Transfer Station Limited	New Zealand	Refuse Transfer Station	**6,091**	**2,142**	**3,835**	**188**	50
Transwaste Canterbury Limited	New Zealand	Landfill Operation	**121,969**	**44,879**	**21,061**	**5,773**	50
Daniels Sharpsmart New Zealand Limited	New Zealand	Supply & Cleaning of Reusable Sharps Containers	**1,582**	**862**	**822**	**37**	50
Total			**169,188**	**63,559**	**35,604**	**8,991**	
2018							
Midwest Disposals Limited	New Zealand	Landfill Operation & Refuse Transfer Station	29,703	8,818	8,313	2,537	50
Pikes Point Transfer Station Limited	New Zealand	Refuse Transfer Station	5,743	2,171	4,007	192	50
Transwaste Canterbury Limited	New Zealand	Landfill	124,808	37,566	21,423	5,815	50
Daniels Sharpsmart New Zealand Limited	New Zealand	Supply & Cleaning of Reusable Sharps Containers	1,447	801	777	49	50
Total			161,701	49,356	34,520	8,593	

All Joint Venture Companies are measured using the equity method of accounting

11 INVESTMENT IN JOINT OPERATIONS

The Group has a 50% interest in Waste Disposal Services, an unincorporated joint venture with Auckland City Council. Waste Disposal Services operates a landfill and refuse station in South Auckland. Audit New Zealand perform the audit of Waste Disposal Services each year. Waste Disposal Services balance date is 30 June. The following share of material assets and liabilities of Waste Disposal Services have been included in the Financial Statements:

	Group 2019 $000	Group 2018 $000
Assets		
Current assets	**2,152**	5,564
Non current assets	**18,977**	19,585
	21,129	25,149
Liabilities		
Current liabilities	**1,061**	3,603
Non current liabilities	**6,956**	7,411
	8,017	11,014
Net assets	**13,112**	14,135
Share of revenues	**10,192**	10,575
Share of expenses	**(5,692)**	(6,452)
Share of operating surplus before taxation	**4,500**	4,123
Share of the joint operation's other comprehensive income	**(521)**	-
Cash Received	**(5,000)**	(4,500)

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12 DEFERRED TAXATION

	Consolidated Statement of Financial Position		Consolidated Statement of Profit or Loss	
Deferred tax relates to the following assets and liabilities	**Group 2019 $000**	Group 2018 $000	**Group 2019 $000**	Group 2018 $000
Property, plant and equipment	**(24,649)**	(24,071)	**(578)**	(1,382)
Trade and other receivables	**629**	260	**369**	139
Intangibles	**(74,975)**	(77,345)	**2,370**	2,365
Provisions	**17,062**	17,503	**(441)**	1,236
Employee benefits	**2,132**	2,229	**(97)**	(886)
Derivative financial instruments	**1,682**	-	**-**	-
Right of use assets	**(73,011)**	-	**(73,011)**	-
Lease liabilities	**73,477**	-	**73,477**	-
Other	**(4,214)**	(6,414)	**2,200**	2,588
Tax assets / (liabilities)	**(81,867)**	(87,838)	**4,289**	4,060

	Consolidated Statement of Comprehensive Income		Balances Acquired	
	Group 2019 $000	Group 2018 $000	**Group 2019 $000**	Group 2018 $000
Derivative financial instruments	**1,682**	-	**-**	-
Tax assets / (liabilities)	**1,682**	-	**-**	-

Reflected in the statement of Financial Position as follows:		
Deferred tax assets - Continuing Operations	**21,504**	19,991
Deferred tax liabilities - Continuing Operations	**(103,371)**	(107,829)
Deferred Net Tax Liability	**(81,867)**	(87,838)

13 BANK AND BANK OVERDRAFT (Unsecured)

	Group 2019 $000	**Group 2018 $000**
Cash at bank and in hand	**(5,000)**	(8,336)
Total bank balances as at 31 December	**(5,000)**	(8,336)

The Group's overdraft facility is $5 million with ANZ and the interest costs at a rate of the reference rate plus a margin of 2.00% per annum.

14 INVENTORY

	Group 2019 $000	**Group 2018 $000**
Raw Materials	**327**	723
Finished goods	**2,103**	2,080
Total inventory as at 31 December	**2,430**	2,803

15 TRADE AND OTHER RECEIVABLES

Current receivables	**NOTES**	**Group 2019 $000**	**Group 2018 $000**
Trade receivables			
- related parties	25	**236**	2,056
- non related parties		**73,131**	75,575
		73,367	77,631
Other receivables		**6,943**	3,632
Total current receivables as at 31 December		**80,310**	81,263

The Group applies the simplified approach to provide for expected credit losses, which permits the use of the lifetime expected loss for all trade receivables. To measure the expected credit losses, trade receivables have been grouped based on shared credit risk characteristics and the days past due. The expected credit losses have also incorporated forward looking information. The loss allowance as at 31 December 2019 is determined as follows:

As at 31 December 2019	Current	Past due: Less than 1 month	Past due: 1 to 3 months	Past due: Over 3 months	Total
	$000	**$000**	**$000**	**$000**	**$000**
Expected credit loss rate	0.22%	0.54%	3.89%	14.66%	2.72%
Gross carrying amount	59,231	6,481	3,622	13,223	82,557
Expected credit losses	**(133)**	**(35)**	**(141)**	**(1,938)**	**(2,247)**

16 PROPERTY HELD FOR RESALE

	Group 2019 $000	**Group 2018 $000**
Vehicles	**2,051**	2,427
Containers	**9**	-
Land	**-**	2,372
Total property held for resale as at 31 December	**2,060**	4,799

Assets held for sale consist of the following:
- Assets that are built for owner drivers on behalf of Waste Management NZ and are expected to be sold within a year.
- Containers purchased by Waste Management NZ specifically for resale to councils that are expected to be sold within a year.
- Residential property purchased under contractual obligation that is expected to be sold within a year.

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17 SHAREHOLDER'S EQUITY

	Number 2019	Number 2018	Value 2019 $000	Value 2018 $000
Shares issued and fully paid up				
209,987,539 ordinary shares @ $1 each	**209,987,540**	209,987,540	**209,988**	209,988
Balance as at 31 December	**209,987,540**	209,987,540	**209,988**	209,988

		Group 2019 $000	Group 2018 $000
Retained Earnings			
Balance as at beginning of year		**63,474**	44,811
Net surplus/ (deficit) for the year		**16,901**	11,992
Transfer from capital notes reserve	18	**5,674**	6,671
Balance as at 31 December		**86,049**	63,474

18 RESERVES

		Group 2019 $000	Group 2018 $000
Hedging reserve			
Balance as at beginning of year		**-**	-
Total recognised income and expenses		**(4,324)**	-
Balance as at 31 December		**(4,324)**	-

The hedging reserve comprises the effective portion of the cumulative net change in the fair value of cash flow hedging instruments related to hedged transactions that have not yet impacted on Statement of Profit or Loss.

Capital note reserve			
Balance as at beginning of year		**16,525**	23,196
Total recognised income and expenses	17	**(5,674)**	(6,671)
Balance as at 31 December		**10,851**	16,525

The capital note reserve comprises the equity component of the $150,000,000 of capital notes issued on 27 June 2014 to BCG NZ Investment Holding Limited. The capital notes have been split into debt and equity components based on the net present value of the expected interest free notes over their life using a rate of 8.80% per annum. Initially the reserve recognised on borrowings was $44,928,762 which includes recognition of a deferred tax liability on the balance with an equity component on the capital notes of $62,401,058 offset by a deferred tax liability of $17,472,296.

Total reserve balance as at 31 December		**6,527**	16,525

19 INTEREST-BEARING LOANS AND BORROWINGS

	NOTES	Group 2019 $000	Group 2018 $000
Non-current liabilities			
Loans from related parties	25	**750,341**	739,791
		750,341	739,791
Current liabilities			
Interest bearing loans and borrowings		**42,400**	40,200
		42,400	40,200
Total Liabilities		**792,741**	779,991

The Company has a loan facility by way of an agreement dated 18 June 2014 for the ability to draw down funds as required from BCG NZ Investment Holding Limited to a limit of $700,000,000.
This facility expires on 30 June 2024.
The facility has three components:
1 - An unsecured term loan of $450,000,000 with an interest rate of 4.76% plus a margin
2 - An unsecured working capital facility of $100,000,000 subject to the interest rate of the term loan
3 - An unsecured subordinated loan of $150,000,000 with an interest rate of 9.36%

As at 31 December 2019 Beijing Capital Group NZ Investment Holding Limited has drawn down the term loan and subordinated loan totalling $600,000,000 (2018: $600,000,000). Subsequent to the initial draw down, principal of ($66,000,000) has been repaid while $90,355,423 of interest has been capitalised leaving a balance owing of $624,355,423 (2018: $615,783,672).

In addition, Beijing Capital Group Investment Holding Limited has by way of an agreement dated 18 June 2014 issued Capital Notes to BCG NZ Investment Holding Limited on 27 June 2014 to the value of $NZ 150,000,000. The final redemption date for these Notes is 30 June 2024.

The capital notes have been split into debt and equity components based on the net present value of the expected cash flows over their life using a rate of 8.80% per annum at the time of recognition. The equity component as at 27 June 2014 was determined to be $62,401,058, with the remaining balance of the $150,000,000 representing the debt component.

During the 31 December 2019 year the expected actual cash flows under the Capital Notes changed as the timing of the triggering of the interest was deferred.
As a result the net present value of the expected cash flows over their life was revalued and ($8,211,906) was released from the debt against the interest expense effective 1 January 2019.

A further $592,352 was recognised in the debt to the interest expense during the year ended 31 December 2019 under the revalued net present value of the expected cash flows over their life.

As at 31 December 2019 the debt component balance of the capital notes was $125,985,910 (2018 $124,007,779). The notes are convertible at the election of the parent based on certain criteria being met. The estimation of the debt and equity component necessarily involves assumptions about when the parent will elect to convert the notes.

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20 PROVISIONS

Closure and post-closure provisions
Provision is made for the future costs of closing the Group's landfills at the end of their economic or consented lives and for the associated post-closure costs, being the aftercare of the landfills for the prescribed periods. Estimated costs, adjusted for inflation, are built up on an item by item basis. The provision held at each balance date, represents the net present value of the estimated future costs. A detailed reassessment of these costs and the anticipated remaining lives of the landfills is performed regularly.

The impact of changes to the provision arising from the reassessment of the lives of the landfills and estimated future costs are capitalised to deferred closure and post-closure costs within property, plant and equipment in the statement of Financial Position. The annual change in the net present value of the provision due to the passage of time is recorded as the time value adjustment of provisions in the Statement of Comprehensive Income. The financial reporting standards require this to be disclosed as an interest cost in the Statement of Comprehensive Income.

	Group 2019 $000	Group 2018 $000
Balance as at beginning of year	**47,195**	44,214
Reversal of unutilised amounts	**(516)**	-
Reassessment of closure and post-closure provision	**591**	2,830
Effect of time value adjustment	**1,000**	1,066
Provision utilised	**(671)**	(915)
Balance as at 31 December	**47,599**	47,195

21 TRADE AND OTHER PAYABLES

Current creditors	NOTES	Group 2019 $000	Group 2018 $000
Trade creditors			
- related parties	25	**660**	885
- non related parties		**25,985**	30,895
Goods and Services Tax payable		**3,285**	4,555
Other creditors and accruals		**26,794**	27,794
Total trade and other payables as at 31 December		**56,724**	64,129

22 OPERATING LEASES
The Group leases its equipment under operating lease arrangements, with leases negotiated for terms of one to two years.
At 31 December 2019, the Group had total future minimum lease receivables under non-cancellable operating leases with its tenants falling due as follows:

	Group 2019 $000	Group 2018 $000
Not later than one year	**410**	497
Later than one year and not later than five years	**415**	583
Later than five years	**-**	-
Total lease commitments as at 31 December	**825**	1,080

During the year, no contingent rentals receivable was recognised by the Group (2018: Nil).

23 CAPITAL COMMITMENTS

	Group 2019 $000	Group 2018 $000
Contracted capital expenditure at 31 December	**23,818**	24,445
Total capital commitments as at 31 December	**23,818**	24,445

24 CONTINGENCIES

	Group 2019 $000	Group 2018 $000
Obligations arising from performance bonds and guarantees given in respect of:		
Redvale Landfill	**29,432**	27,978
Tirohia Landfill	**5,485**	5,485
Whitford Landfill	**7,614**	7,169
Kate Valley Landfill	**7,900**	7,056
Bonny Glenn Landfill	**500**	-
Local authority waste collection contracts and other activities	**24,993**	10,915
Total contingent liabilities as at 31 December	**75,924**	58,603

Contingencies include the Group's share of associate companies contingencies.
The directors are of the opinion that none of these obligations will eventuate.

At balance date, the Taxation Authority in New Zealand continues its reviews of the Group's tax position. The reviews are ongoing and at this time it is too early to identify the adjustments that may arise, if any.

At balance date, the Ministry of Business, Innovation and Employment ("MBIE") in New Zealand has yet to conclude its review of the Group's application of the Holiday Pay legislation. Their review is on ongoing and at this time it is too early to identify if any adjustments may arise.

There are no other known contingent liabilities in existence subsequent to balance date.

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For the year ended 31 December 2019

25 RELATED PARTY DISCLOSURES

Identity of related parties

The ultimate parent of the Group is the State-owned Assets Supervision and Administration Commission of the State Council based in Beijing. The immediate parent of the Group is BCG NZ Investment Holding Limited based in Hong Kong. The Group has a related party relationship with its subsidiaries (see Note 9), associates (see Note 10), joint venture (see Note 11) and with its Directors and Executive Officers. The ultimate Parent Entity is Beijing Capital Group Co Limited.

	NOTES	Group 2019 $000	Group 2018 $000
The following trade receivables were owed to the Group by related parties at balance date:			
Waste Disposal Services [1]		**80**	87
Pikes Point Transfer Station Limited [2]		**-**	157
Midwest Disposal Limited [3]		**156**	25
Transwaste Canterbury Limited [4]		**-**	1,787
	15	**236**	2,056
The following revenue was earned from related parties during the year:			
Waste Disposal Services [1]		**1,254**	929
Pikes Point Transfer Station Limited [2]		**2,501**	2,691
Midwest Disposal Limited [3]		**1,695**	1,241
Transwaste Canterbury Limited [4]		**23,178**	22,623
Burwood Resource Recovery Park Limited [5]		**1,525**	2,389
		30,153	29,873
The following trade payables were owed by the Group to related parties at balance date:			
Waste Disposal Services [1]		**(417)**	(486)
Pikes Point Transfer Station Limited [2]		**(26)**	-
Midwest Disposal Limited [3]		**-**	(399)
Transwaste Canterbury Limited [4]		**(217)**	-
	21	**(660)**	(885)
The following charges from related parties were incurred during the year:			
Waste Disposal Services [1]		**(3,285)**	(3,692)
Pikes Point Transfer Station Limited [2]		**(3,596)**	(3,596)
Midwest Disposal Limited [3]		**(8,199)**	(6,773)
Transwaste Canterbury Limited [4]		**(7,209)**	(7,280)
Burwood Resource Recovery Park Limited [5]		**(39)**	(32)
Daniels Sharpsmart New Zealand Limited [7]		**(882)**	(875)
		(23,210)	(22,248)
Non Current Loans from related parties:			
BCG NZ Investment Holding Limited - Capital Notes	19	**(125,986)**	(124,007)
BCG NZ Investment Holding Limited - Interest Bearing	19	**(624,355)**	(615,784)
		(750,341)	(739,791)
The following interest was charged by related parties during the financial year:			
BCG NZ Investment Holding Limited	5	**(62,107)**	(67,475)
		(62,107)	(67,475)

[1] Waste Disposal Services is an unincorporated joint venture with Auckland Council Property Ltd
[2] Pikes Point Transfer Station Ltd is 50% owned with Envirocare Ltd
[3] Midwest Disposal Ltd is 50% owned with Enviro Waste Services Ltd
[4] Transwaste Canterbury Ltd is 50% owned with 5 other territorial local authorities
[5] Burwood Resource Recovery Park Ltd is 100% owned by Transwaste Canterbury Ltd
[6] Tiromoana Station Ltd is 100% owned by Transwaste Canterbury Ltd
[7] Daniels Sharpsmart New Zealand Ltd is 50% owned with SteriHealth Pty Ltd

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NOTES TO THE CONSOLIDATED FINANCIAL STATEMENTS
For the year ended 31 December 2019

26 FINANCIAL INSTRUMENTS

		Group 2019 $000	Group 2018 $000
Fair Value of hedging instruments held:			
Forward commodity contracts	Non-current	**(2,166)**	(113)
	Current	**(4,287)**	(1,141)
		(6,453)	(1,254)

Derivative financial instruments are used by the Group in the normal course of business in order to hedge exposure to fluctuations in interest, foreign currency rates and movements in electricity prices.

Electricity price swaps are designated as hedging instruments in cash flow hedges of forecast sales in electricity price.
These forecast transactions are highly probable, and the swaps are being used to hedge the electricity price exposure of fixed price range from 60 to 112.46 with notional amount of NZ$18,105,628.12.

There is an economic relationship between the hedged item and the hedging instrument as the terms of the swaps match the terms of the expected highly probable forecast transactions.
The Group established a hedge ratio of the hedging relationship is the same as the resulting from the quantity of the hedged item.
To measure the hedge effectiveness, the Group compares the changes in the fair value of the hedging instruments against the changes in fair value of the hedged items attributable to the hedged risks.

Hedging ineffectiveness can arise from:
Changes to the forecasted amounts of cash flows of hedged items and hedging instruments.

The Group holds the following electricity price swaps:

	Maturity: less than 3 months	3-6 months	6- 9 months	9-12 months	1-2 years	2-5 years	Total
As at 31 December 2019							
Electricity price swap (highly probable forecast sales)							
Notional amount	2,823,361	2,500,821	2,771,324	2,041,760	7,772,018	196,344	18,105,628
Fixed Price	68.63 - 112.46	72.01 - 98.23	73.24 - 97.46	60 - 83.39	60.25 - 83.39	80 - 80	

The impacts of the hedging instruments on the statement of financial position are as follows:

	Notional amount	Carrying amount	Line item in the statement of financial positon	Change in fair value used for measuring hedge ineffectiveness for the year
As at 31 December 2019				
Electricity price swap	18,105,628	6,453,496	Derivative financial instruments (liabilities)	6,453,496

	Change in fair value used for measuring hedge ineffectiveness for the year	Cash flow hedge reserve
As at 31 December 2019		
Highly probable forecast sales	6,005,913.84	4,324,257.97

The effects of the cash flow hedge on the statement of profit or loss and the statement of comprehensive income are as follows:

	Total hedging gain/(loss) recognised in OCI			Change in fair value used for measuring hedge ineffectiveness for the year	Line item in the statement of P&L
	Gross amount	Tax effect	Total		
As at 31 December 2019					
Highly probable forecast sales	12,012,472	(3,363,492)	8,648,980	- 806,859	Other expenses

	Amount reclassified from OCI to P&L			Line item (gross amount) in the statement of P&L
	Gross amount	Tax effect	Total	
As at 31 December 2019				
Highly probable forecast sales	6,006,417	(1,681,797)	4,324,620	Other expenses

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27 LEASES

The Group as a lessee
The Group has lease contracts for various items of land and buildings, plant and machinery and motor vehicles used in its operations. Leases of land and buildings and plant and machinery generally have lease terms between 1 and 52 years while motor vehicles generally have lease terms between 1 and 5 years. Generally, the Group is restricted from assigning and subleasing the leased assets outside the Group.

(a) Right-of-use assets
The carrying amounts of the Group's right-of-use assets and the movements during the year are as follows:

	Land and buildings NZ$	Plant and machinery NZ$	Motor vehicles NZ$	Total NZ$
As at 1 January 2019	56,194	29	2,053	**58,276**
Additions	211,584	197	2,712	**214,493**
Depreciation charge	(7,569)	(46)	(1,248)	**(8,863)**
Others	(1,176)	-	(30)	**(1,206)**
As at 31 December 2019	**259,033**	**180**	**3,487**	**262,700**

(b) Lease liabilities
The carrying amount of lease liabilities and the movements during the year are as follows:

	NZ$
Carrying amount at 1 January 2019	58,275
New leases	212,548
Interest expense	2,879
Payments	(10,058)
Others	(1,225)
Carrying amount at 31 December 2019	**262,419**
Analysed into:	11,164
Current portion	251,255
Non-current portion	**262,419**

28 SUBSEQUENT EVENTS

There were no material events subsequent to balance date that would affect the interpretation of the Financial Statements or the performance of Beijing Capital Group NZ Investment Holding Limited and its subsidiaries as at 31 December 2019 (2018: Nil).

Subsequent to end of the financial year, the COVID-19 outbreak was declared a pandemic by the World Health Organization in March 2020.

We have seen a significant impact on parts of our business since the NZ Government announced the country wide lockdown on 23 March 2020 with effect of 26 March 2020. The outbreak and the response of the Government in dealing with the pandemic is interfering with general activity levels within the community, the economy and the operations of our business. The scale and duration of these developments remain uncertain as at the date of these financial statements however they will have an impact on our earnings, cash flow and financial condition.

It is not possible to estimate the impact of the outbreak's near-term and longer effect or the Governments' varying efforts to combat the outbreak and support businesses. This being the case, we do not consider it practicable to provide a quantitative or qualitative estimate of the potential impact of this outbreak on the Group at this time.
The financial statements have been prepared based upon conditions existing at 31 December 2019 and considering those events occurring subsequent to that date, that provide evidence of conditions that existed at the end of the reporting period. As the outbreak of COVID-19 occurred after 31 December 2019, its impact is considered an event that is indicative of conditions that arose after the reporting period and accordingly, no adjustments have been made to financial statements as at 31 December 2019 for the impacts of COVID-19.

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Independent auditor's report to the Shareholder of Beijing Capital Group NZ Investment Holding Limited
Report on the audit of the financial statements

Opinion

We have audited the financial statements of Beijing Capital Group NZ Investment Holding Limited ("the Company") and its subsidiaries (together "the Group") on pages 5 to 26, which comprise the consolidated statement of financial position of the Group as at 31 December 2019, the consolidated statement of comprehensive income, consolidated statement of changes in equity and consolidated statement of cash flows for the year then ended of the Group, and the notes to the consolidated financial statements including a summary of significant accounting policies.

In our opinion, the consolidated financial statements on pages 5 to 26 present fairly, in all material respects, the consolidated financial position of the Group as at 31 December 2019 and its consolidated financial performance and cash flows for the year then ended in accordance with New Zealand equivalents to International Financial Reporting Standards Reduced Disclosure Regime.

This report is made solely to the Company's shareholder. Our audit has been undertaken so that we might state to the Company's shareholder those matters we are required to state to them in an auditor's report and for no other purpose. To the fullest extent permitted by law, we do not accept or assume responsibility to anyone other than the Company and the Company's shareholder, for our audit work, for this report, or for the opinions we have formed.

Basis for opinion

We conducted our audit in accordance with International Standards on Auditing (New Zealand). Our responsibilities under those standards are further described in the *Auditor's Responsibilities for the Audit of the Financial Statements* section of our report.

We are independent of the Group in accordance with Professional and Ethical Standard 1 (revised) Code of Ethics for Assurance Practitioners issued by the New Zealand Auditing and Assurance Standards Board, and we have fulfilled our other ethical responsibilities in accordance with these requirements.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our opinion.

Ernst & Young provides taxation compliance services and taxation advisory services to the Group. Partners and employees of our firm may deal with the Group on normal terms within the ordinary course of trading activities of the business of the Group. We have no other relationship with, or interest in, the Group.

Emphasis of Matter: Subsequent Events – Impact of the Coronavirus (COVID-19) Outbreak

We draw attention to Note 28 of the financial statements which notes the World Health Organisation's declaration of the outbreak of COVID-19 as a global pandemic subsequent to 31 December 2019 and how this has been considered by the Directors in the preparation of the financial statements. As set out in Note 28, no adjustments have been made to financial statements as at 31 December 2019 for the impacts of COVID-19. Our opinion is not modified in respect of this matter.

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Information other than the financial statements and auditor's report

The directors of the Company are responsible for the Annual Report, which includes information other than the consolidated financial statements and auditor's report.

Our opinion on the consolidated financial statements does not cover the other information and we do not express any form of assurance conclusion thereon.

In connection with our audit of the consolidated financial statements, our responsibility is to read the other information and, in doing so, consider whether the other information is materially inconsistent with the consolidated financial statements or our knowledge obtained during the audit, or otherwise appears to be materially misstated.

Directors' responsibilities for the financial statements

The directors are responsible, on behalf of the Company, for the preparation and fair presentation of the consolidated financial statements in accordance with New Zealand equivalents to International Financial Reporting Standards Reduced Disclosure Regime, and for such internal control as the directors determine is necessary to enable the preparation of consolidated financial statements that are free from material misstatement, whether due to fraud or error.

In preparing the consolidated financial statements, the directors are responsible for assessing on behalf of the entity the Group's ability to continue as a going concern, disclosing, as applicable, matters related to going concern and using the going concern basis of accounting unless the directors either intend to liquidate the Group or cease operations, or have no realistic alternative but to do so.

Auditor's responsibilities for the audit of the financial statements

Our objectives are to obtain reasonable assurance about whether the consolidated financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes our opinion. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with International Standards on Auditing (New Zealand) will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of these consolidated financial statements.

A further description of our responsibilities for the audit of the consolidated financial statements is located at the External Reporting Board website: https://www.xrb.govt.nz/standards-for-assurance-practitioners/auditors-responsibilities/audit-report-7. This description forms part of our auditor's report.

Ernst + Young

Chartered Accountants
Auckland
20 April 2020

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Financial Position of Waste Management NZ Limited

Waste Management is Aotearoa's leading materials recovery, recycling and waste management provider, with over 1600 team members across 70 locations.

Each year we collect over 1,000,000 tonnes of waste and recycle well over 200,000 tonnes. We are the largest composter in New Zealand, the largest waste-to-energy provider and have the largest commercial electric fleet in New Zealand, all powered by electricity from waste.

On 1 April 2022 Beijing Capital Group announced the sale of the Waste Management New Zealand business to Igneo Infrastructure Partners.

Igneo Infrastructure Partners is the direct infrastructure business of First Sentier Investors.

First Sentier Investors (previously known as Colonial First State Global Asset Management) is a global fund manager with a client base that extends across Asia, Australia, Europe and North America. First Sentier Investors had A$251.0 billion of funds under management as at 31 December 2021, invested across equities, fixed income, infrastructure and multi-asset solutions. First Sentier Investors, previously owned by Commonwealth Bank of Australia, is owned by MUFG, one of the world's largest financial groups. Headquartered in Tokyo and with over 360 years of history, MUFG has a global network with around 3,000 locations in more than 50 countries. The MUFG group of companies offers services including commercial banking, trust banking, securities, credit cards, consumer finance, asset management and leasing. The MUFG group of companies aims to "be the world's most trusted financial group" through close collaboration among their operating companies, by flexibly responding to all of the financial needs of their customers, and fostering shared and sustainable growth. MUFG's shares trade on the Tokyo, Nagoya and New York stock exchanges. For more information, visit https://www.mufg.jp/english.

Igneo Infrastructure Partners has a track record of more than 20 years investing in infrastructure assets on behalf of over 100 institutional investors. Igneo Infrastructure Partners has experience in managing almost 50 infrastructure investments in Europe, Australia and Asia since September 1994 with a current portfolio that includes investments in New Zealand, Australia, the United States and throughout Europe.

Igneo Infrastructure Partners has a focussed strategy of investing into infrastructure assets such as gas, water and electricity networks, oil, gas and chemical storage facilities, airports, ports, rail, toll roads, transport services, renewables and fixed telecommunications network infrastructure assets in OECD countries. Igneo Infrastructure Partners also has strong global experience in the waste sector through its current investments in: Integrated Waste Services (Australia), enfinium (UK), MVV Energie (Germany/UK/Czech Republic) and Rialto Bioenergy Facility (US).

Igneo Infrastructure Partners has a particularly strong track record investing in New Zealand. Its two largest current New Zealand investments are:

- *First Gas Limited*: The operator of a large gas distribution network and the entire transmission network in New Zealand (which includes associated investments in *Rock Gas*, a significant LPG retailer and distributor, and *Flex Gas*, the operator of the Ahuroa gas storage facility); and;
- *Tuatahi First Fibre Limited (previously known as Ultrafast Fibre Limited):* Tuatahi First Fibre Limited is responsible for building, maintaining and operating a fibre network in the Waikato, Taranaki, Bay of Plenty and Manawatu-Whanganui regions.

Through these investments, Igneo Infrastructure Partners understands the necessary requirements for operating successful large scale infrastructure businesses in New Zealand, including servicing a

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broad customer base and building strong relationships with suppliers, regulators and other key stakeholders.

Igneo Infrastructure Partners will draw on its infrastructure investment and operating experience across multiple geographies, including its extensive experience investing in New Zealand and specific expertise in the waste management sector, for the benefit of operating Waste Management NZ Limited. Igneo Infrastructure Partners is an active and responsible investment manager. A strong focus on environmental, social and corporate governance is integral to its acquisition and operation of WMNZ. Igneo Infrastructure Partners' long term investment horizon means it will consider the longer term impacts of issues such as environmental change in operating WMNZ.

The Igneo business plan does not currently contemplate the sale of any material assets of the business; instead there is strong support for the growth of the business including the development of the Auckland Regional Landfill, expansion of waste recovery capabilities and the progressive electrification of the fleet.

Acquisition financing and the Igneo business plan has been sized to ensure that the business can continue to meet its obligations on performance bonds and insurance coverage under its respective customer contracts.

Further, Igneo is committed to ensure that the business continues to deliver the same high quality of service and responsiveness that customers have experienced following the change of control to Igneo.

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Prosecutions or Complaints in the Last Five Years

The following table provides a summary of prosecutions or complaints received over the last five years:

Prosecutions or Complaints Last 5-Years					
Year	**Council**	**Type**	**WM Business Unit**	**Subject**	**Corrective Action Taken**
2021	Bay of Plenty Regional Council	Abatement Notice	WMNZ Tauranga Recycling	7.1 Discharge of suspended solids to stormwater in excess of prescribed limits. 7.6 Sample analysis shows Copper, Lead and Zinc discharged to stormwater in excess of prescribed limits.	Remedial work agreed with Regional Council to undertake stormwater system upgrades in 2022. An above ground filter has been approved and is currently being installed.
2021	Bay of Plenty Regional Council	Abatement Notice	WMNZ Tauranga Recycling	6.7 Material being stored without cover. 7.7 Results of Sampling not made available to BoPRC within one month. 8. Stormwater system not maintained in good working order.	All remedial work has been completed. Awaiting Council Officer site visit.
2020	Auckland Council	Formal Warning	WMNZ	Formal warning in respect of mud / dirt tracking onto Dairy Flat Highway – Breach of Section 15(1)(b) of the Resource Management Act (RMA) 2001 Mud was being tracked onto the highway from the Redvale Landfill site.	
2019	Taranaki Regional Council	Infringement/non-compliance	WMNZ	Unauthorised discharge - rubbish onto land.	WMNZ has received a letter from Taranaki District Council commending practices. This has been included in **Appendix G.**
2018	Auckland City Council	Warning	WMNZ	Technical breaches of its resource consent at Redvale Landfill for the level of leachate within the liner exceeds the consent limit in the landfill.	No fine. Leachate level is now below consent limit.
2018	Waikato Regional Council	Infringement	WMNZ	Discharge of stormwater potentially contaminated with leachate, onto land, where it may enter water.	Technical breach relates to a historic stormwater diversion that has been rectified.
2017	Waikato Regional Council	Abatement (2)	WMNZ	Storage and stockpiling of end-of-life tyres in a manner than breaches section 9(2) of the RMA.	Develop an EMP which details the management actions that WMNZ will take to ensure that the risk of stormwater contamination and fire are adequately controlled. Site vacated July 2018.
2017	Waikato Regional Council	Abatement	WMNZ	Breach of condition 3 of consent 108428. This condition requires the Consent Holder to maintain a maximum head of leachate of no more than 300mm on the base liner.	This was an undisclosed condition inherited from the previous owners and fully remedied by WMNZ. Abatement notice lifted and site remains in full compliance with this condition.
2017	Taranaki Regional Council	Abatement	WMNZ	Non-compliance with the Regional Freshwater Plan.	Site stormwater infrastructure identified as having insufficient capacity for significant storm events. Remedial work and upgrade to system capacity completed to bring site to full compliance.

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Notices

Prohibition, infringement, or improvement	Reason	Corrective Action
Prohibition notice # WSNZ 17498	2017 Worksafe inspector formed a view that the site was not handling and receiving asbestos in line regulations	Site trained two workers for B class asbestos Site reviewed work instructions and risk assessments to ensure they aligned with regulations All site staff were trained in asbestos awareness Contractors bringing asbestos waste to site are now required to pre-book a disposal slot so waste area can prepare for load being tipped, and are told about disposal requirements – double wrapped, no damaged wrapping, etc Asbestos activities regularly monitored to ensure processes are being followed
Prohibition notice # WSNZ 28081	2019 Due to a workplace event that resulted in a Worksafe investigation, a notice was placed on a vehicle involved in the event (details of event are under Agency Investigation information). The notice required the COF updating, risk assessment regarding potential fall out of the truck when undertaking tasks from the left, repair of worn standing area, and consider fall prevention from vehicle	The COF expired when the truck was isolated due the event. When Worksafe attended site they requested the COF be renewed before the truck was used (COF would have been updated if the truck was in use. Expired due to being locked out) A risk assessment for operating from the left was already in place for the activity. This was reviewed, submitted to Worksafe, and approved. The floor plate in the standing well area was replaced and new monitoring procedure implemented to ensure these were part of the daily pre-start A barrier was designed and installed on the LEV. Worksafe were due to attend to the site to review and see how it worked. Worksafe never attended site and requested photos. Truck returned to work activity
Improvement notice # WSNZ 36355	2017 At a meeting between WMNZ and Worksafe, it was raised by a WMNZ manager that a hose used in an attempt to put a fire out was not long enough. Notice required a longer hose be installed	A review of all emergency equipment on site was undertaken and where required upgraded to ensure fit for purpose. Information sent to Worksafe and improvement notice lifted
Improvement notice # WSNZ 36361	2019 Improvement regarding Management of Change process not being used at site.	An independent consultant was engaged to assist and train staff on site regarding management of change (MOC) process and procedures. MOC is now reviewed monthly at management meeting to ensure process is always followed. Information sent to Worksafe and improvement notice lifted

Prohibition, infringement, or improvement	Reason	Corrective Action
Improvement notice # WSNZ 36360	2019 Improvement regarding lack of information on work instructions (WI) for packaged waste disposal. Review required to ensure WIs give adequate detail and information for user	Workshops held with managers and staff to review and improve WIs for packaged waste disposal Workers trained in revised WIs to ensure understanding and requirements Information sent to Worksafe and improvement notice lifted
Improvement notice # WSNZ 36357	2019 At a meeting between WMNZ and Worksafe, it was raised by a WMNZ Manager that there was not a formal process in place to inspect mixing pit between operations	New work instructions were developed to ensure a more formalised and documented process to prevent any further events of incompatible products creating a risk. Information sent to Worksafe and improvement notice lifted

Agency Investigation

Agency	Event	Corrective Actions
Worksafe/NZ Police No action taken	2017 A fatality occurred when a low entry vehicle was undertaking kerbside collections. Driver appeared in court as part of Police investigation and was cleared of any wrongdoing.	This was a tragic accident, the investigation found WM, the driver and vehicle held no fault for the event occurring At a Coroners inquest, it was suggested that WM consider the installation of additional safety features on the truck to assist the driver but also take in to account the risk these may cause – increased distractions to the driver. Upon considering the outcome of the Coroners inquest and testing additional safety devices, additional safety devices were implemented; - Front motion sensors - IA equipment to detect objects approaching from the rear that may enter blind spots The trucks already have blind spot oval mirrors of front and side, rear view cameras, and side view cameras. A number of these safety features were then part of WMs on-going truck build programme

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Agency	Event	Corrective Actions
Worksafe Company was sentenced November 2020 under sections 36(1)(a), 48(1) and 2(c) of the Health and Safety at Work Act 2015. No employees were prosecuted	Event date November 2017. Operating a conveyor belt with guards removed resulting in degloving of worker arm. Worker reached in to remove debris while conveyor belt was running. Guards had been removed by an external belting company and plant was not locked out in line with Waste Management's company procedures. Contractor who was engaged to manage the site on behalf of Waste Management instructed workers to operate the plant with the guards removed after being told by Senior Manager to lock out the machine and replace the guards. Contract unfortunately failed to list H&S duties and responsibilities so his actions were attributed to Waste Management Guards were fixed guarding and deemed appropriate by guarding specialists and WorkSafe during prosecution hearing.	Plant was locked out and never restarted. New state-of-the-art plant was built in Auckland. New site management team was established. Plant fitted with interlocking guarding. Lock out and tag out processes revised, and all staff trained Reiterated to people that it's ok to say 'No' if requested to do something unsafe – operate plant without guards, and you will be fully supported. National review completed on conveyor belts to ensure correct guarding place – fixed or interlocking. National culture assessment undertaken by EMT – attending random sites and conducting meetings with front line workers on what is done well and what could be done better Supported injured worker (agency employee) through rehabilitation Attempted to recruit injured worker but were unsuccessful Contractor was removed from company Belting company never used again
Worksafe Company was sentenced May 2022.	2017 – Waste Management Technical Services While mixing water that was thought to be containing heavy metals, H2S was released unexpectedly, and a staff member was exposed to a high concentration of the gas. The staff member passed away some hours after the event.	In August 2018, WorkSafe charged Waste Management under Sections 48 and 36 of the Health & Safety at Work Act for failing to comply with health and safety duties. Waste Management made an early guilty. WorkSafe fined Waste Management. Corrective actions. Following this incident, an immediate process safety review and audit was undertaken by an independent engineer for the Waste Management Technical Services division and extensive remedial actions were recommended. These have all been implemented by Waste Management.

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Agency	Event	Corrective Actions
2019 Worksafe No action taken	2019 While driving from the left-hand side position of a low entry vehicle, the driver (agency worker) has exited the truck while moving resulting in significant injury. See Prohibition notice # WSNZ 28081 covered under Notices.	The investigation identified that the driver was trained on the work instruction, risk assessment, and deemed competent to undertake the task safely. What was unknown to WM was a personal medical condition that was not declared to the agency the driver was working for, or during the pre-employment medical that had been completed (was in the process of becoming a fulltime employee for WM). It was assumed (Worksafe would not share personal medical history due to privacy laws) that the driver had a personal medical event that resulted in them losing consciousness and exiting the cab unintentionally. The vehicle the driver fell from is a low entry vehicle used for kerbside recycling or bag collections. When operating from the left, the speed of the truck is governed to approximately 45kph, has an automated braking system (when the foot is removed from the accelerator the trucks comes to stop automatically) and has a number of handhold points to ensure three points of contact are maintained at all times. The risk assessment for the task was reviewed to consider personal medical events and a fall prevention device was designed and installed to prevent someone unintentionally exiting the cab while in motion. This however then created additional risks of someone who has a medical event then potentially being stuck in the cab with their foot still on the accelerator which would result in a runaway truck. Trials continue

Notifiable events (in addition to the above investigations and prosecution)

2017	Driver crossed a railway line as a train was coming	Reported to Worksafe who passed on to TIAC.
2019	While refuelling an item of plant, a worker was hit when a excavator slewed around.	Reported to Worksafe. No action or investigation undertaken by Worksafe. Just requested copy of internal investigation and corrective action report
2020	Member of public fell while unloading waste at transfer station.	Reported to Worksafe. No action or investigation undertaken by Worksafe. Contacted member of public for confirmation of event.
2020	Member of public fell of trailer while unloading waste at transfer station	Reported to Worksafe. No action or investigation undertaken by Worksafe.
2021	Road traffic accident.	Notified Worksafe as a precaution. No involvement by Worksafe

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Tō tātou tāone
Our city

Appendix C

Decarbonisation Evidence

For Future Generations Sustainability Report

2020

Pūrongo Toitū

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From our Managing Director

I am pleased to present Waste Management's 2020 For Future Generations sustainability report.

This, our second report, reflects the challenges experienced by our business, New Zealand and the globe as we faced the impact of COVID-19. While we are not out of the woods yet, we are optimistic about our ability to continue to deliver on the commitments we have made.

Against our baseline year of 2017, Waste Management achieved a decrease in operational greenhouse gas emissions (by intensity using revenue) of 10.6%, against our target of 7.5%.

We achieved this mainly through reduced operations due to the impact of COVID-19 on our business throughout the year, in particular impacts on diesel use, shipping and air travel. Our goal by 2025 is a 22% reduction against baseline, but these reductions will be much more challenging as the economy recovers and business returns to normal over the course of the next year through to 2025.

To ensure we remain focused on the changes required to achieve our greenhouse gas emission targets, we are pleased to have developed an intensity measure for tracking our GHG emissions; another step towards having a greater understanding of our progress, while we seek to grow and at the same time reduce the environmental footprint of our business.

In addition, site level monthly carbon footprint reporting was developed for over 60 of our sites. This takes our ownership and understanding of emissions further into the organisation and we believe it will ensure we have an even wider ownership of the reductions we have committed to as a member of the Climate Leaders Coalition.

I was personally pleased to attend our first supplier event, hosted in our new Auckland head office at East Tamaki, once COVID-19 restrictions allowed. It was wonderful to host 10 suppliers as planned, and we had very positive feedback from the 17 people who attended.

A highlight for Our Communities, while we didn't achieve our target of 15,000 social media followers,

– a significant achievement for the team as the interesting, useful, and engaging content. We to seek to use social media to engage with the community across New Zealand.

In terms of Our Customers we were pleased, t the challenges for our teams working from hor lockdowns, we were able to launch a new app medium enterprises called GoBIZ.

You will notice in this report that we have once refreshed our goals and targets, setting new a targets for 2021, ensuring we are moving towa stretch targets for 2025.

We remain committed to maintain advice from Sir Rob Fenwick when he said to us we were " set high targets to strive for, even if you might so" and we continue to do exactly that.

Finally, I would like to acknowledge that during we added Dr Hugh Logan to our External Advi Board. Hugh's experience includes serving as the Ministry for the Environment and the Depa Conservation, and before that heading New Ze Antarctic Programme. He also helped develop New Zealand's waste minimisation legislation (including the waste levy), nation-wide contam sites and climate change legislation (including emissions trading scheme in 2008).

As we now look to 2021 and beyond, I reiterat Management's commitment to the important w all programme areas of Our Customers, Our C Our Environment, Our People and Our Busine

I am pleased to present this report as evidenc the results of our work over the past 12 month 1 January 2020 to 31 December 2020) and ou ambitions for future generations.

Evan Maehl
Managing Director
Waste Management

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ort

aunch of our first Global
I) sustainability report in
agement is proud to present
sustainability report.

ity work we have done
2020 year dominated by
our original sustainability
rations which was launched in
more ambitious goals and

ctured according to our five
themes (Our Environment,
ustomers, Our People and Our
r progress in delivering on this
period from 1 January to 31
y updates are also available

pared in accordance with
ative (GRI) Sustainability
e option. This incorporates
eholder inclusiveness,
teriality, and completeness
our material issues with the
entify the disclosures required.
which summarises the range
orted on, is included in

wed by our external
oard, providing a valuable
rogress, performance, and
oduction to our Board can

Our Material Issues

During the development of our For Future Generations sustainability strategy in 2018, Waste Management worked to identify the future sustainable material key issues for us by engaging with both internal and external stakeholders.

A wide cross-section of both internal and external stakeholders were engaged with. Each stakeholder provided their views on the material issues they believed to be key for a forward-thinking, sustainable waste company to address now and in the future.

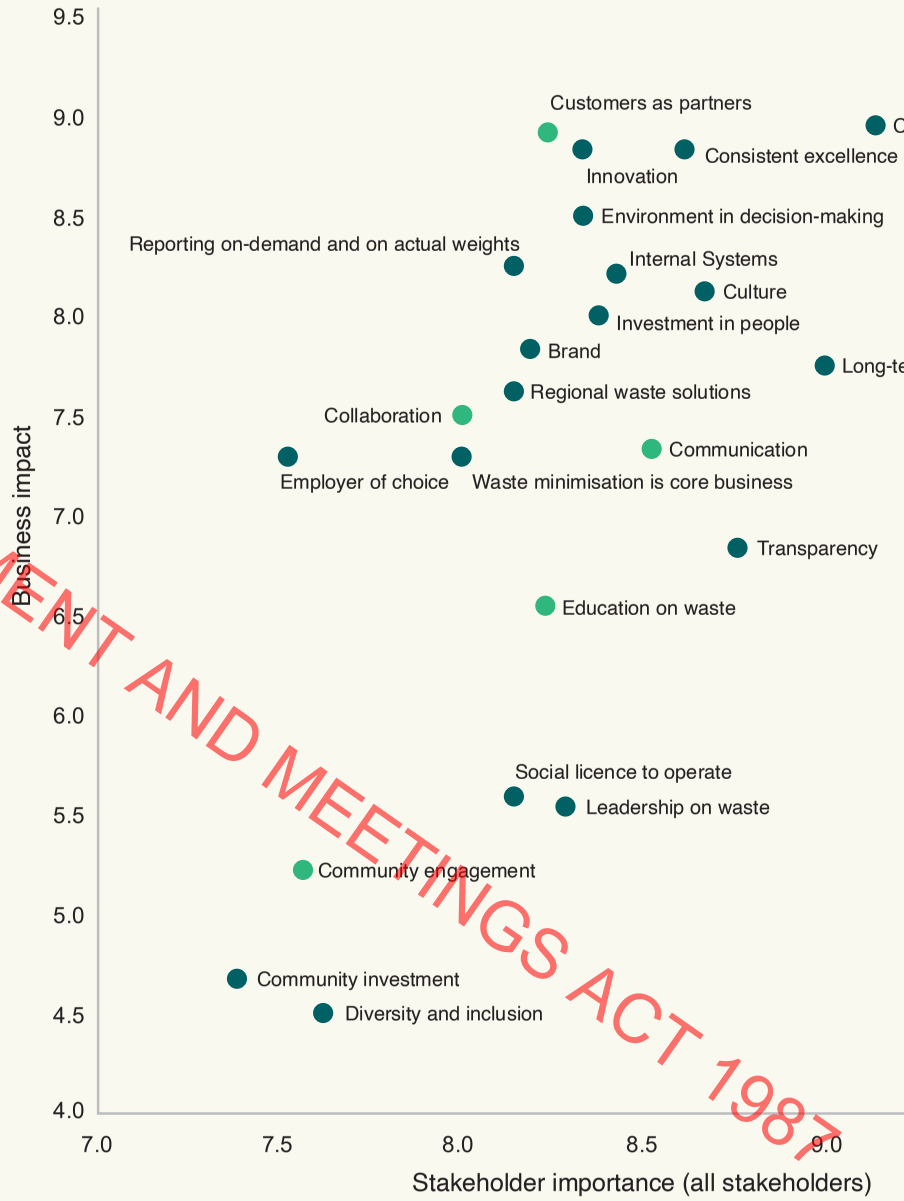
26 issues were identified as material for Waste Management through this process. They are the issues that are key for us to address to ensure we are moving towards a successfully sustainable future. After our stakeholder engagement exercise, more than 50 of Waste Management's leaders reviewed and assessed the identified issues to assess their impact on our business.

These two rankings of external stakeholder importance and impact on the business created our materiality matrix. This matrix presents the issues that are the most urgent for us to address – those that appear in the top right-hand corner of the matrix. We have also highlighted the top five issues that our external stakeholders identified as requiring improvement. These material issues are reflected in our sustainability strategy and performance reporting.

A full list of the material issues identified through this process, and their definitions, is included in Appendix ii.

A further review of our material issues has been delayed due to COVID-19 and is planned for the next sustainability report.

Material Matrix



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57,788
tCO_2e OPERATIONAL EMISSIONS, A 7% REDUCTION FROM OUR BASE YEAR 2017

1,082,318
TONNES COLLECTED

16 ELECTRIC TRUCKS
CONVERTED END OF 2020

WE CAN POWER THE EQUIVALENT OF
24,000
HOMES WITH RENEWABLE ENERGY

880
TRUCKS

GAS CAPTURE EFFICIENCY GREATER THAN
95%

32%
LIGHT FLEET MOVING TO ELECTRIC BY 2021

100%
OF LEACHATE CAPTURED

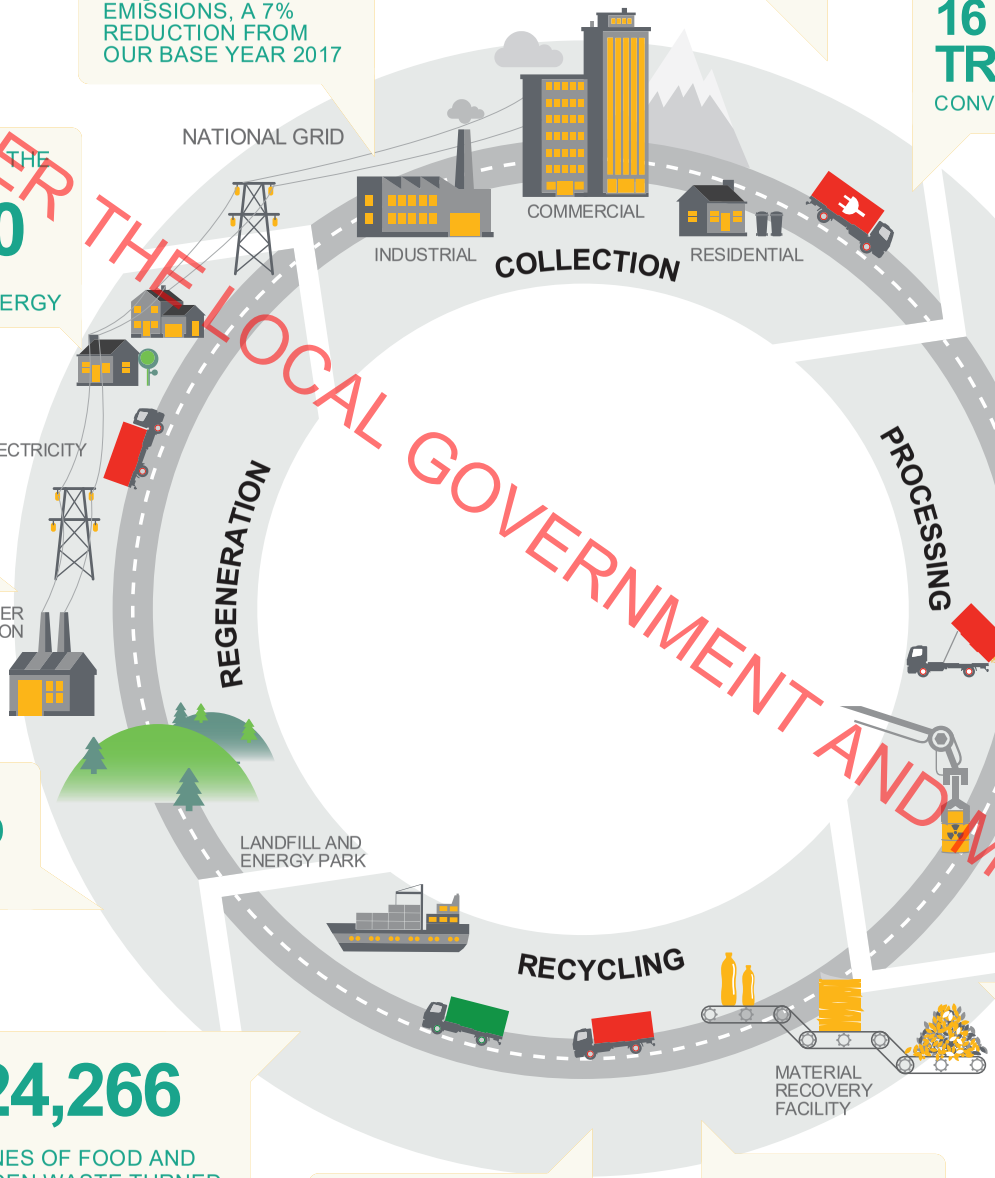
63,348
TONNES OF HAZARDOUS WASTE REMOVED AND TREATED

124,266
TONNES OF FOOD AND GARDEN WASTE TURNED INTO COMPOST

86,529
TONNES OF RECYCLING COLLECTED

10,226
TONNES OF OLD TYRES TURNED INTO TYRE DERIVED FUEL

33%
OF PLASTICS COLLECTED AND PROCESSED ARE SOLD WITHIN NZ



Ensuring healthy
facilities, priori
energy and water us
proactive initiatives

Proa
knowledge by

inno
their wa
attai

Maintain
supp
and w
growth

Deliverin
solutions-base
us towards
economy by
and a profitable

VID-19 response
ssential service

ost of us within
d of COVID-19, but it was at
vareness. It was happening
nething we watched on the
terest.

m the virus was short lived.
w Zealand's first case of
two-weeks later anyone
m overseas was required
And then came the bombshell
larch when the Prime Minister
g into Level 3 lockdown
n Level 4 to follow 48

declared. Schools were shut.
essential services closed their
npty.

e of great uncertainty and
orried about whether the virus
ined, and there were huge
on our economy, our jobs and

e had a responsibility to
der New Zealand public to
ealand's waste as an

of whom were juggling
massively elevated stress
adapt and deliver what

very single team member
have asked for a more resilient
d we remain extremely grateful
ple Waste Management

xecutive Management Team
uss operational needs and

how our teams around the country could continue to do their jobs safely.

The safety of our frontline workers who were required to be out physically doing the work of Waste Management was top a priority. Comprehensive health and safety protocols were quickly created by our Safety and Risk team. COVID-19 appropriate personal protective equipment (PPE) was sourced and made available for every worker. Daily briefings were given to the team before they took to the streets.

Those who could, worked from home and the ICT department undertook the massive job of rolling out necessary equipment and network connections for remote working.

Many commercial collections were not required during the lockdowns, and our teams quickly adapted to new and reduced routes as required. Our customers were a priority, and we let them know via our website and email that we would not let them down and their waste needs would still be taken care of. We also gave our customers information on how they could pause their services if necessary.

The Executive Management Team sent out daily email communications to our 1645 workers, held regular virtual management meetings and ensured all our team members had ongoing contact with a manager, supervisor or teammate.

Our communications included links to the Waste Management intranet, where we posted updates in real time, as well as messages of gratitude received from the community. These messages of support meant so much to our team and helped keep spirits high.

We wanted transparency to be a theme of our communications because people were concerned for their jobs, and we are very proud we were able to do this, while keeping all our workers employed during COVID-19.

This connection with our team, along with their incredible resilience and comradery, has meant we've come through multiple lockdowns stronger.

The team's feedback

We conducted a survey in late 2020 to gauge from our team how well Waste Managem did during COVID-19. We had a good response rate, with almost a third of our workfor taking part.

Some of the key findings were:

- 83% of the team were extremely or very confident they had the right resources and support from Waste Management during the lockdown
- 92% agreed or strongly agreed that appropriate safety measures were taken during different phases of lockdown
- 85% were extremely or very confident in the leadership team to make the right deci through COVID-19
- 83% agreed or strongly agreed that they felt informed about the company's goals a priorities when working from home

"I felt honoured to work for Waste Management and valued that we were taken care of it made a huge financial relief to not have to worry about bills."

"Quick response to a very reactive and fluid situation. Very clear and consistent communication to the wider business. Communication covered critical points and FAQ this gave staff trust and confidence in the company."

"The high level of support provided by Waste Management to all workers. There was a focus on ensuring all workers had the correct PPE and that there were enough supplies for all workers. Enabling staff who were able to work from home, enabled most workers remain safe in their bubbles."

"Waste Management demonstrated high communication and also was very employee-ce in its care of our people."

What next

Having navigated multiple alert levels and lockdowns, we feel extremely confident in o team's ability to deal with any further outbreaks of COVID-19 – or any kind of major business disruption.

One of the positives that came from the COVID-19 lockdowns was enforced working fr home. Many in our team responded positively to this, and we have formalised the abili work from home in our Alternative Workplace Policy.

We were also so inspired by our team, that we have reworked our company values to include a value which acknowledges our solidarity and togetherness.

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Case Study: Hoomanol

OVID-19 had not yet reached
nd had not yet been declared
chnical Services Specialist
Hooman Javaheri recognised
rus was spreading rapidly in

at the critical controls for
the virus are hand and surface
hygiene protocols. Hooman
nagement could prepare bulk
npany, as it was becoming
supply shortages.

on as an opportunity to put
d manufacturing knowledge
reagent and formulating an
a view to create hand sanitiser
nt team.

optimal mixture ratios of
ycerine for skin moisturising
ant smell. He found that
isopropanol was the most appropriate alcohol for efficacy, cost and supply. He then put the proposal to management, who quickly supported the plan to formulate in-house hand sanitiser. Thousands of litres were produced under Hooman's guidance and dispatched to the Waste Management branches across New Zealand during the first lockdown.

Affectionately named after its creator, Hoomanol was an essential item for our frontline staff to feel safe while continuing to carry out their duties in a time of stress and uncertainty. In addition to this, Hooman considered the need for easy surface sanitisation, so developed and distributed a Work Instruction and accompanying Risk Assessment for safely diluting household bleach to make a spray disinfectant.

Throughout all of this, Hooman was constantly considering the safety of the Waste Management whānau as well as his own. He was recognised at the 2020 Waste Management Awards for his outstanding contribution during COVID-19, receiving our coveted Innovation Award.

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Challenges

he New Zealand move towards a future low carbon world supported by a circular
ange of challenges and issues we need to address.

emissions/

ves climate change is the
al issue facing New Zealand –
s a major risk to our business,
umanity.

ns through an environmental
r the impact of our activities
ions, energy and water use,
diversity.

was an early signatory to the
and was the first company
e independently certified for
ur greenhouse gas emissions
uce. We also supported
e Change Response
t Act, back in 2017.

p can deliver the change
hange alone, and we support
takeholders across
the issue.

as emissions reduction

Circular economy:

New Zealand's focus needs to be on reducing waste by addressing throw-away consumerism and the economic drivers perpetuating this. A focus on "diversion from landfill" is unlikely to lead to waste minimisation. For example; focusing on a solution which increases the recycling waste stream, where a better solution could be to minimise the waste in the first place.

Circular outcomes are possible for some specific waste streams in New Zealand, such as turning food waste and garden waste into compost, as we do at Living Earth; recycling glass or old corrugated cardboard – but many other waste streams require a product stewardship scheme and investment in suitable infrastructure to sustainably process the materials.

It is vital that the net carbon impact should also be included in any discussion around waste minimisation, the circular economy or other changes to management of waste streams in New Zealand.

Electric vehicles:

We are committed to reducing our greenhouse gas

We were the first to introduce 100% plug-in electric trucks into a waste collection fleet in New Zealand, and have opened a purpose-built facility to assemble more EV trucks. At the end of 2020 we had 16 electric trucks, as well as 87 electric cars and light vehicles in our fleet. We will keep increasing this number and, with a total fleet of over 800, expect to make a significant emissions reduction impact.

Landfills and waste-to-energy:

Waste Management recycles as much of the waste we collect as possible, however there remains a need to safely contain those wastes that cannot be recycled. The most environmentally responsible solution available in New Zealand for such waste streams is landfill. Modern engineered landfills are nothing like the "dumps" of the past. A modern landfill and green energy centre is a high-tech facility which produces renewable energy and through engineering controls and safe management practices, protects the natural environment.

In addition, waste carbon emission reduction should be the test against which all waste minimisation activities are measured. Many current waste diversion practices will fail a greenhouse gas emissions test against disposal in landfill, especially if they involve combustion and/ or long-distance transportation.

Waste disposal levy:

Waste Management supports expanding the waste disposal levy equally across all types of disposal facilities, with the exception of those designed to process or eliminate waste streams from priority products under the Product Stewardship Scheme.

Waste itself imposes costs on the environment, society, and the economy and should therefore be levied. The facility is merely the instrument for collection and payment of the levy to the government.

We believe recipients of the levy fund (including local government) should be held accountable for delivering waste minimisation, as well as a reduction in greenhouse gas emissions.

Kerbside bag collections:

Reusable bins are the safest, most environmentally

- They are reusable
- They prevent pests/animals the waste
- They prevent injuries to our sharp objects in the waste

By contrast, plastic bags:

- Go to landfill after a single
- Are prone to breaking, caus
- Do not protect our team fron

Incineration:

Waste-to-energy (WtE) incinera receive municipal waste strea regular supply of waste to deli investment. Without an ongoi decades, the WtE incinerator operationally sustainable. This Zealand's goals as stated in th Act, namely to encourage was decrease in waste disposal.

Incineration also releases carb when it would otherwise be se a landfill.

The costs associated with Wt than current methods of waste as such, would need governm it a viable proposition for com

Product stewardship

Waste Management NZ agree priority products identified by Environment's (MfE) Proposed Priority Product Stewardship S recommend the waste industr practical, local input on the ef schemes under consideration also be required to evaluate ea the following:

- Transport, collection, sortin disposal costs
- Contribution to NZ's Carbo

or Future
s

rpose is to keep
ul for future generations.

rrent and future
aland's lifestyle
g, processing and
our customers and

om our sustainability

d in our Materiality Matrix)
s which include:

nt

es

which contain a series
dicators (KPIs), with set
KPIs are achieved, our
This also addresses the

ss and achievements

ed Nations
ent Goals

re Generations sustainability
Development Goals (SDGs)
s which our strategy

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Our Environment

As an organisation, our purpose is *Keeping Aotearoa New Zealand beautiful for future generations*.

The key projects in this programme area reflect a continuation of our efforts to ensure protecting the environment is embedded into our company, including reducing our carbon footprint and engaging with our staff and suppliers to support them protecting the environment and reducing their greenhouse gas emissions, along with a focus on regenerative plantings were possible.

Tō Tātau Taiao

Ko te kaupapa o te whakahaere he tiaki i tō tātau taiao ātaahua mā te whakahaere toitū i ā tātau rawa.

Our COVID-19 Response

While continuing to remove, recycle and treat waste during lockdowns and raised alert levels, Waste Management decreased its operational carbon footprint (by intensity) by 10.6% against our target of 7.5% for 2020.

We achieved this mainly through reduced operations due to the impact of the pandemic on our business throughout the year, in particular impacting upon diesel use, shipping and air travel.

What we want to achieve:

- We view all major decisions through an environmental lens, specifically prioritising the impact of our activities on our carbon footprint, energy and water use, direct discharges, and biodiversity.
- We will reduce environmental harm generated by our customers and c
- We will build on our circular econo our procurement decisions.

2020 in Review

The following table summarises our projects, KPIs and progress achieved during 2020.

Goals	Projects	2020 KPI	Status	P
1. Reduce Carbon Footprint	Implement activities from our independently verified carbon footprint reduction plan to reduce our operational carbon footprint in line with our commitments as a signatory to the Climate Leaders Coalition	7.5% reduction in Waste Management's 2020 operational carbon footprint against a 2017 baseline	Achieved	1 c d th
	Work with our team members to help them reduce their personal carbon footprints	2% of Waste Management team members have measured their carbon footprint and have plans to reduce their greenhouse gas emissions	Achieved	3 a c in th E w
2. Expand sustainable procurement	Implement activities to encourage suppliers to reduce their carbon footprint	Ten large suppliers to attend a Waste Management event on carbon footprint reduction	Achieved	1 a p E O
	Develop and implement Code of Conduct and performance management framework for suppliers that explicitly includes sustainability criteria and outcomes	Code of Conduct and performance management framework rolled out to 80% of suppliers (by spend) and 100% of all new contracts	Partly Achieved	C M c e 8
	Develop and implement a procurement framework for corporate services project sourcing that incorporates "cost v. delivery v. sustainability" weighting methodology	50% of new procurement tenders by 2020	Achieved	C p 2
3. Increase regenerative	Expand support for community programmes that deliver regeneration in areas where we	One new community regeneration project identified and funded	Achieved	F T th

ects	2021 KPI	2025 KPI	2021 updates
ment activities from dependently verified n footprint reduction o reduce our operational n footprint in line with our nitments as a signatory to limate Leaders Coalition	10% reduction in Waste Management's operational intensity carbon footprint against a 2017 baseline	22% reduction in Waste Management's 2025 operational intensity carbon footprint against a 2017 baseline	2.5% increase and change to an intensity target
with our team members to hem reduce their personal n footprints	4% of Waste Management team members have measured their carbon footprint and have plans to reduce their greenhouse gas emissions	10% of Waste Management team members have measured their carbon footprint and have reduced their greenhouse emissions by 10%	2% increase in target
ment activities to urage suppliers to reduce carbon footprint	Twenty suppliers have attended a Waste Management event on carbon footprint reduction	100 suppliers have attended a Waste Management event on carbon footprint reduction	Increase in target to 20 suppliers
op and implement Code nduct and performance gement framework for iers that explicitly includes inability criteria and omes	Code of Conduct and performance management framework reviewed against 20% of current suppliers (by spend)	Code of Conduct and performance management framework rolled out to 100% of suppliers	Updated to reviewing suppliers who have received the Code of Conduct & performance framework
op and implement regular nunication and engagement our suppliers regarding inable procurement	Creation of a supplier communication plan with at least one communication sent to 100% of suppliers	Quarterly engagement with 100% of suppliers	New KPI for 2021 for supplier engagement
nd support for community ammes that deliver eration in areas where perate	One new community regeneration project identified and funded	10% annual increase in plantings directly by Waste Management or through support of our community partners	No change

bution

he supports six United Nations Sustainable Development Goals (SDGs). Our carbon footprint reduction efforts and the renewable nergy Parks support SDGs 7 and 13. The sustainable procurement goals promote decent work and economic growth (SDG 8) ble cities and communities (SDG 11) and ensuring responsible consumption (SDG12). None of this can be achieved in isolation, ental to Our Environment theme (SDG 17), such as the supplier carbon footprint reduction event held with Toitū Envirocare.

ORK AND GROWTH | 11 SUSTAINABLE CITIES AND COMMUNITIES | 12 RESPONSIBLE CONSUMPTION AND PRODUCTION | 13 CLIMATE ACTION | 17 PARTNERSHIPS FOR THE GOALS

Case Study

Tiromoana Bush regeneration

Rare native plants are making a comeback near Kate Vall & Energy Park.

New Zealand's rarest mistletoe species are now – against – growing in Tiromoana Bush, next to Kate Valley. They a mistletoe, white mistletoe or tāpia, and green mistletoe o

What makes their growth so special is that they are all ar parasites – which means instead of germinating on the g require a host species to live on.

For example dwarf mistletoe can only grow on kānuka, m exceptionally rare.

Over the years Waste Management has been actively inv regenerating Tiromoana Bush.

It's been a hugely successful project, with before and aft (above) showing the difference over 15 years.

Local iwi have also recently visited the site and there hav discussions around the setup of an onsite nursery to eco natives for future planting.

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mmunities

es throughout New Zealand,
roviding environmental
Our teams work within these
ng the economy and providing

me reflect the feedback through
nt that our communities are wanting
ut need our help, knowledge,
g the right choices as well as
r our staff to directly support
ing work hours.

o ngā hapori puta noa i Aotearoa
ga me te whakahere whakaurunga
i. Mahi ai ō mātau rōpū i roto i
i te ōhanga me te tuku i ngā

sponse

e have a responsibility to our
New Zealand public to continue
waste as an essential service.

mbers of our team were part
e working group, ensuring that
y on their waste being collected and
ghly stressful and uncertain times.
for our fellow Kiwis.

Material Issues

Communication | Community engagement | Community investment | Education on waste | Leadership on waste

What we want to achieve:

- We engage proactively with our local communities and raise awareness of how waste and environmental services operate in New Zealand by sharing knowledge that tells the story of waste, including recycling, composting, landfill and speciality waste streams.
- We are a strong communicator and advocate, vocal on w
the public domain by engaging with central and local gov
providing leadership in the wider waste industry.
- We invest in local communities, particularly in areas that
and environmental services, working in partnership with t

2020 in Review

The following table summarises our projects, KPIs and progress achieved during 2020.

Goals	Projects	2020 KPI	Status	Progress
1. Improve mutual understanding with stakeholders	Develop and implement an improved proactive engagement approach with our stakeholders on key issues	Stakeholder engagement plan delivered with 75% satisfaction score in end of year survey	Partly Achieved	Stakeholder en delivered with p during 2021
2. Improve community understanding of issues relating to waste	Increase tours at our landfills to help the community understand where their waste goes	At least one community tour runs at each landfill during 2020 (Redvale, Whitford, Tirohia and Kate Valley)	Partly Achieved	There were cha multiple lockdo community tou
	Support education programmes around waste minimisation with New Zealand kids	In partnership with Keep New Zealand Beautiful, provide a copy of the Kiki Kiwi children's book to all NZ primary schools	Achieved	1,978 Kiki Kiwi primary/interme national kinderg
	Use social media to engage with wider New Zealand community beyond our customers	15,000 followers across our social media channels	Partly Achieved	11,760 social m aspirational goa the end of 2019
3. Expand engagement with our local communities	Use volunteering to increase our contribution to the communities in which we operate	Establish an annual half-day volunteering programme for every team member	Partly Achieved	Framework for established and

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ects	2021 KPI	2025 KPI	2021 updates
op and implement an ved proactive engagement oach with our core holders on key issues Government and local munity)	The Government's Waste Minimisation review considers the full impact of carbon. Engagement initiated with four specific iwi	90% satisfaction score in end of year survey and stakeholder engagement plan reviewed and updated annually	Updated focus on key stakeholders iwi, Government and local community
ase our reach and gement of the community ey understand where their e goes	Create digital content on landfills and waste which achieves 100,000 click views	At least four tours at each of our landfills during 2025 (Redvale, Whitford, Tirohia and Kate Valley)	Updated to use modern digital tools
ort education programmes d waste minimisation with Zealand kids	Deliver an educational teaching resource on waste	Reach more than 200,000 New Zealand children by supporting targeted waste education programmes	KPI updated for a wider educational impact
ocial media to engage with New Zealand community nd our customers	20,000 followers across our social media channels and create two partnerships using social media to achieve broad reach engagement	50,000 followers across our social media channels	Expanded to include social media partnerships
olunteering to increase our bution to the communities ch we operate	Establish an annual half-day volunteering programme opportunity for every team member	90% of team members volunteering for a half-day each year	Clarified as a voluntary opportunity for 2021 and 2025 targeted updated to 90%
ase engagement with Māori ocal iwi	Establish a strong marae connection for our Auckland Head Office	Establish five new Māori engagement activities	New KPI for 2021 on Māori and iwi engagement

bution

me supports five SDGs. Engaging and educating our stakeholders and surrounding communities about a future circular . This will lead to more sustainable cities and communities (SDG 11) and responsible consumption and production (SDG 12). wasteful society will also lead to a reduction in greenhouse gas emissions. For these goals to be achieved we will be working in holders. For example, during 2020 we partnered with Keep New Zealand Beautiful to provide the Kiki the Kiwi book to all primary throughout the county (SDG 17).

LE CITIES UNITIES

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

13 CLIMATE ACTION

Case Study

Haere mai Sonny

Nau mai, haere mai to Sonny Wilcox, who joined Waste Management as Manager of Māori Partnerships in 2020

Sonny, who is originally from Waikare in the Bay of Islan Te Kapotai, Ngāti Hine, Ngāti Te Ara, Te Māhurehure and affiliation, has helped our team develop relationships wi hapu, provide strategic advice and lead stakeholder eng Importantly, Sonny has also helped build greater unders Māori culture and language within Waste Management.

Fluent in te reo Māori, Sonny has a strong background i leadership, having worked as both a youth and social w as Māori liaison officer for the Counties Manukau police multiple voluntary capacities.

Most recently Sonny worked at Manukau Institute of Tec (MIT) as the Māori Development Manager specialising in cultural competency and confidence training.

Sonny says he aims to provide a Māori perspective and building new connections between Waste Management Māori community.

"The goal should be to create safe spaces for people to meaningfully engage with our indigenous Māori culture

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chnology and continuously
ay activities that contribute to
and optimised business that
ner value. Our customers want to
eve their waste goals effectively

tance of new digital technology along
d-fashioned service for our customers,
to ensure we do so.

atonga para me te taiao tētahi take e
ā mātau kiritaki, ā, e kitea ai tēnei i roto
auka. Ko te hiahia o ā mātau kiritaki
ēhea te tutuki i ā rātau me ā rātau
inga kia whaitake, kia toitū.

sponse

ers and communities we would
ork of Waste Management during
gular communications on our website,
sonal phone calls from our sales team.
ications after every alert level change,
n stand-by throughout. Kia ora to
roha you sent us during 2020.

Material Issues

Brand | Collaboration | Consistent excellence | Customers as partners | Customer experience | Transparency

What we want to achieve:

- We create a positive experience for all customers, and we are transparent and honest about the solutions we can and cannot provide.
- We have reporting and information available for our customers about their waste and environmental services and invest in new ways to improve this.
- We help our customers through easy-to-understand reporting of this data.
- Waste Management works proactively to achieve our custo
- We seek to partner rather than have transactional relation customers, working together to achieve their sustainabili
- We are better collaborators and partner with others to de for customers and for our communities.

2020 in Review

The following table summarises our projects, KPIs and progress achieved during 2020.

Goals	Projects	2020 KPI	Status	Progress
1. Improve customer experience	Implement ongoing improvements in digital and service delivery solutions for our customers	5% improvement in customer experience measure	Partly Achieved	System to collec Score) data crea during 2021
2. Enhance our partnerships with customers	Identify opportunities to partner with customers (and others) to implement new initiatives that support their sustainability goals	10 new initiatives implemented, with outcomes tracked and reported	Partly Achieved	Despite several delayed due to t on our customer five initiatives we different partner
3. Improve digital solutions	Increase the number of customers using digital solutions	10% increase in the proportion of orders placed online or through digital channels	Achieved	12% increase in through digital c
	Launch online tools to provide better information about waste for customers	At least one new solution launched with 100 visits per month	Achieved	GoBiz online too commercial cust their accounts o customers signe

- 2021-2025 Goals

ects	2021 KPI	2025 KPI	2021 updates
ment ongoing vements in digital and e delivery solutions for ustomers	5% year-on-year improvement in customer experience measure	5% per annum increase in customer experience measure	No change
fy opportunities to er with customers (and s) to implement new ives that support their inability goals	10 new initiatives implemented, with outcomes tracked and reported	50 new initiatives implemented, with outcomes tracked and reported	No change
ase the number of mers using digital ons	30% increase year-on-year in the number of orders placed online or through digital channels	10% per annum increase in the number of orders placed online or through digital channels year-on-year	Changed to a 30% increase in year-on-year digital orders
ch online tools to de better information t waste for customers	At least one new solution launched with 100 visits per month	10% per annum increase on number of visits to online tools	No change

bution

supports four SDGs. Our work to improve customer experience will support the decent work and in their businesses which will lead to more sustainable cities and communities (SDG 11) and and production which will result in less waste (SDG 12). We are moving to enhance the partnership , supporting SDG 17.

INABLE CITIES OMMUNITIES

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

17 PARTNERSHIPS FOR THE GOALS

Sustainability Partner, Tyron Hartle, who works on circular economy initiatives, helped bring about our partnership with All Heart NZ.

Case Study

Partnership with All Heart NZ

In 2020 we were very proud to sign an impact partnership agreement with All Heart N aim of helping redirect our customers' waste.

All Heart NZ is a social enterprise that supports communities by providing reusable n people in need. They partner with corporates to practically redirect and repurpose re and unwanted items, as well as promote sustainable, ethical and social aspects of pr and supply chain management.

Through our relationship with All Heart NZ, Waste Management is now able to offer it redirection service to our commercial customers. It means customers with unwanted have them redirected to support hundreds of communities across Aotearoa, creating economy rather than ending up as waste.

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Material Issues

Culture | Diversity and inclusion | Employer of choice | Health and safety | Investment in people

What we want to achieve:

- We maintain our ethos that health and safety is our top priority.
- Our team are proud to work for Waste Management and share their waste industry knowledge with others.
- We invest in training and development of our team at all levels.
- We have an inclusive culture and working practices
  all levels of the company.
- We are seen as an employer of choice within New

2020 in Review

The following table summarises our projects, KPIs and progress achieved during 2020.

Goals	Projects	2020 KPI	Status	Progress
1. Reduce significant injury and fatality incidents	Conduct bowtie risk assessments to identify the causes, preventative safety controls, reactive safety measures and consequence for each of our 13 critical safety risks (details on page 18)	100% completion for all critical risks	Achieved	Bowtie assessmer for all critical risks
	Educate all managers and supervisors in each bowtie and management of identified critical risks	100% of supervisors and managers trained	Achieved	All managers train risk assessments
2. Increase diversity and cultural literacy	Develop programmes to increase cultural literacy and diversity across our teams	Creation of a Diversity Committee	Achieved	Framework for Div Foundation Comm established and d early 2021
	Measure the effectiveness of diversity and inclusion programmes through capturing accurate data from new and existing team members	Ethnicity data requested from 100% of new employees (and sought from 50% of existing employees)	Achieved	Ethnicity data requ new employees ar to all existing emp 22% responding

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ople

be motivated, engaged and in highly
eaders contributing to a high performing
will be supported by a culture of
nt, inclusivity and accountability.

focusing on KPIs that will support the
l and mental health of our employees,
ncouraging diverse and inclusive

ka tautuhia ko ā mātau tāngata tētahi o
ātau aromatawai ukauka, e whakaata ana
gata kia puta ai a Waste Management hei
ā.

sponse

ent Team was in daily communication with
mmunications included links to the Waste
ere we posted updates in real time, as well as
ceived from the community. These messages
h to our team and kept spirits high.

to be a theme of our communications
ncerned for their jobs, and we are very proud
while keeping all our workers employed
nnection with our team, along with their
comradery, has meant we've come through
ger.

- 2021-2025 Goals

ects	2021 KPI	2025 KPI	2021 updates
uce the number of incidents ss each of our 13 critical y risks (details on page 18)	**a)** Rollout and training of bowtie risk assessments to non-process safety team members for each of our 13 critical risks **b)** No recurring 'opportunities for improvement' identified in internal or external HSE audits	10% reduction in incidents for identified critical risks	Focus updated to reducing incidents across our 13 critical safety risks through rollout of bowtie risk assessments and no recurring opportunities for improvement from audits
lop programmes to ase cultural literacy and sity across our teams	Diversity committee meets at least five times; a programme of activities is developed and implemented during 2021	A recurring Māori leaders programme in place, and at least one other diversity or cultural literacy initiative implemented per annum	Updated from creation to Diversity Committee meeting five times with programme of activities developed
lop programmes to ort the physical health well-being of our team	10% increase in participation in Waste Management-provided annual health check-up programme based on 2020 figures	90% engagement in Waste Management provided health check-up programme	New KPI with focus on our teams' physical health
lop programmes to ort the mental health well-being of our team	Mental health awareness training created and delivered nationally to 100% of Waste Management employees	A regular mental health support programme developed and implemented across Waste Management	New KPI with focus on our teams' mental health

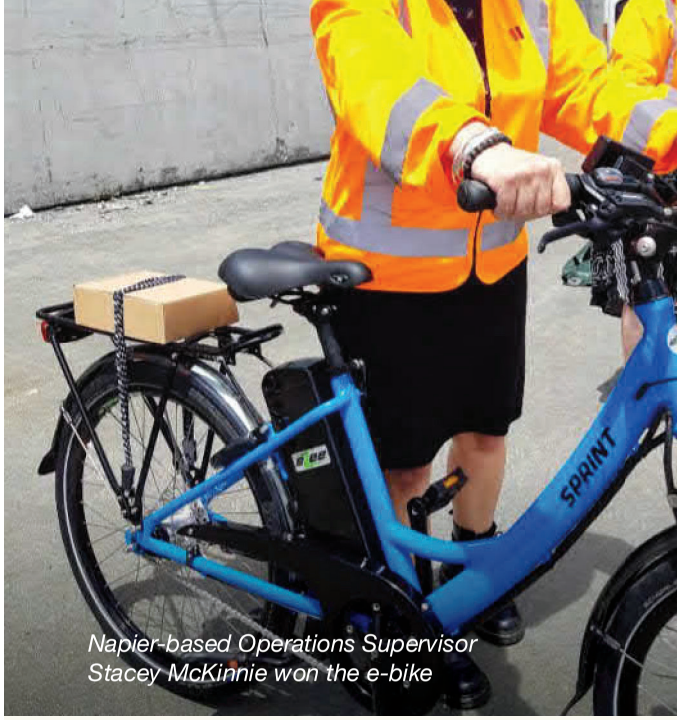
bution

pports four SDGs. The work on our 13 critical risks supports good health and well-being (SDG 3) and our programmes to e gender equality (SDG 5) leading to decent work and economic growth for all (SDG 8). All of this can only be achieved by n to our team members (SDG 4).

TY TION

5 GENDER EQUALITY

8 DECENT WORK AND ECONOMIC GROWTH



Napier-based Operations Supervisor Stacey McKinnie won the e-bike

Case Study

Team competition to reduce personal carbon footprints

To support our people to reduce their personal carbon f we instigated a competition which ran during October 2

To enter, the team needed to measure their carbon emis using the Toitū Envirocare carbon footprint calculator, a commit to making changes to reduce their total.

Our sustainability team sent each team member person simple-to-follow tips on how to make reductions, and e who took part went in the draw to win an e-bike.

A total of 48 team members took up the challenge, surp goal of having 2% of the Waste Management team take be looking to do even better in 2021 – and our goal for have 10% of staff measure their carbon footprint and re greenhouse gas emissions by 10%.

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siness

ting sustainably, we can
ivering value for our
nities, driving carbon
rcular economy forward
nd.
delivering new products,
nce in strategy execution
se this.

e whakaata ana tēnei
ga waiwai, pūmau hoki o
e mātau me te hiranga o
te hapori. Mā te toitū o
hi, ka tino whānui ngā hua
, ā-pūtea hoki mō Aotearoa

sponse

he world we felt the impact
om line. However, we
een able to retain all our
offer all the services that
me to rely on us for.

Material Issues

Compliance | Innovation | Integrity | Internal systems | Long term profitability

Regional solutions | Reporting on demand and actual weight | Social licence to operate | Waste minimisation is core business

What we want to achieve:

- We develop solutions to suit different-sized markets across New Zealand.
- We are a net-positive business with a strong social licence to operate.
- We have full legal compliance across all of our sites, services and operations at all times.
- We are honest, ethical, and act with strong moral principles of right
- We lead the waste sector in positive transitional change to make wa and minimisation profitable.
- We have robust internal systems and processes, with data available progress against key performance indicators.
- We are profitable over the long-term.

2020 in Review

The following table summarises our projects, KPIs and progress achieved during 2020.

Goals	Projects	2020 KPI	Status	Progress
1. Contribute to New Zealand's circular economy	Develop partnerships with New Zealand manufacturers, who are customers, to support and drive the circular economy	One initiative commenced	Achieved	A new formal partnership v NZ was formed as an Impa All Heart NZ will be suppor assisting our wider sustain by providing an additional for our customers unwante
2. Manage climate change risk	Identify, assess and mitigate Waste Management's climate change risks	Climate change risk register created, with risk mitigation plans implemented, tracked, and reported	Partially Achieved	Externally managed climat risk screening report creat Waste Management's key change risks for each type asset and facility. This will developed in 2021
3. Minimise our own waste	Implement the 2020 Waste Management Plan	100% of waste data from 80% of sites (by volume) captured and reported	Partially Achieved	All sites have been allocate member to manage collect and reporting

- 2021-2025 Goals

ects	2021 KPI	2025 KPI	2021 updates
op partnerships with isations to drive the ar economy	One initiative commenced	Five initiatives commenced since 2020	Updated to wider partnerships beyond manufacturing with any organisations to drive the circular economy
fy, assess itigate Waste gement's climate ge risks	Climate Change Risk Register finalised, accountability assigned and aligned with Corporate Enterprise Risk Register	Climate Change Risk Register updated and reviewed each year, with risk mitigation plans implemented, tracked and reported	Simplified to managing climate change risks and aligning with our corporate risk register
ment the 2020 e Management Plan	Review data being captured and set baseline along with developing at least one new initiative	5% reduction in waste per annum per site (once baseline data has been captured)	Addition of the development of a new initiative

bution

supports four SDGs. Efforts to manage climate change risks supports decent work and and industry, innovation, and infrastructure (SDG 9). Contributing to moving towards a ucing our own waste will support sustainable cities and communities (SDG 11) and and production (SDG12).

RY, INNOVATION FRASTRUCTURE

11 SUSTAINABLE CITIES AND COMMUNITIES

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

Case Study

318 East Tamaki Road

At the start of 2020 Waste Management moved our Auckland-based team of around 400 employees to a new headquarters in East Tamaki Road.

The new facility was designed around sustainability, and was recognised at the 2020 Property Industry Awards – winning the Green Building Award, the Industrial Property Award and the Supreme Award.

Judges describe it as: "a fit-for-purpose, world-class development which innovatively combines operational and non-operational activities whilst improving corporate welfare.

"In an industry not readily acknowledged as innovative, Waste Management New Zealand is setting themselves a new benchmark through a focus on sustainability, innovation, workplace design and a collaborative owner and

Features of the site include:

- Numerous electric car and truck c facilities
- A rainwater harvesting system fea separate rainwater harvesting area tanks in total – each holding 25,00 rainwater. That's 175,000 litres – e 17,500 wheelie bins!
- A jellyfish filtration system which t stormwater quality, removing float oil, debris and a high percentage bound pollutants
- Living green walls and multiple gre
- Locally sourced building materials environmental impact.

During the build an impressive 99.5% waste and 76% of construction wast from landfill.

The Auckland team is relishing the ne

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s New Zealand's leading resource
aste management provider.

1,000,000 tonnes of waste and
nd are constantly looking for new
purpose, redirect, neutralise and

s across the country for many
e and recycling for commercial
te treatment for industry and
esidential homes.

le resource, which can be
ycled back into a circular
reenwaste into compost,
ins, and old tyres into fuel,
beneficial, sustainable re-use
e.

wning and managing modern
where waste is carefully
ll gas. This gas is used to
ricity that can power more than
w Zealand. We are also proud
of leachate from our landfills
during 2020.

gement Technical Services
al services for hazardous waste,
biohazardous waste, sharps,
nd asbestos. In 2020, 63,348
e was removed on behalf of
d.

cilities across New Zealand
als from old, corrugated
astics, enabling such waste
ommodity input into making
6,529 tonnes of such materials
d.

have more than 20 years'
c waste into compost. Our plant
cesses nearly 50,000 tonnes of
ually. In 2020, 124,266 tonnes of
as turned into compost by our
ationwide.

rovides a fast, simple, and
old through national retailers
waste, or construction and

Changes to our operations during 2020

During 2020, we continued to evolve our operations in response to market needs.

We welcomed the opening of two new operational sites. West Auckland gained a new transfer station at the end of November, and a new resource recovery park was opened in December in Hamilton.

Due to local councils choosing different operators, our Waiheke Island Refuse Transfer Station operation closed in June. Also, our transfer station in Hamilton shut down its operations in September in preparation for the new site opening as detailed above.

Values

Our current values have been in use for a number of years, and these values are under review to ensure they capture the essence of a future sustainable waste service provider. The outcome from this review, and any adjustments required, will be released during 2021.

Health and Safety

The well-being of our people remains core to our success, with health and safety a critical focus. We look out for each other and everyone we have contact with, and we manage our environment to keep everyone safe.

To ensure this happens throughout our company, we have developed robust health, safety, environmental, and quality (HSEQ) systems which are externally audited to ensure the safety of all team members, as well as members of the public.

We have a nationwide training plan, which includes two main types of training - core and elective.

All our team members are required to complete core training, comprising of five courses:

- Company induction
- Site induction
- Risk management awareness
- Injury management
- Environmental awareness

Elective training courses are identified for individual employees, based on compliance and risk management for their position. Elective training includes numerous modules in the following categories:

- Safety and environment

each month. These assess and review best practice safety procedures and are a forum for improving our performance through shared experiences. Every meeting involving four or more Waste Management staff starts with a "safety moment", where one attendee provides a relevant safety tip or observation for the benefit of everyone.

Where applicable, Waste Management sites also have a dedicated safety committee, which regularly reviews that branch's own safety performance. Where sites don't have a dedicated safety committee, the site utilises the site Toolbox Talk to ensure an ongoing focus on health and safety.

Risk identification

We have identified 13 critical safety risks, which are the hazards that pose the highest consequence of injury or ill health in our operations, and we have a comprehensive strategy to raise awareness of these risks and to address them.

- CR1 Collisions
- CR2 Exposure to Hazardous Substances
- CR3 Insecure Loads, Trucks, Stacks and Storage
- CR4 Loss of Control
- CR5 Exposure to Uncontrolled Energy
- CR6 Electricity/Arc Flash
- CR7 Falls from Heights
- CR11 Fire/Explosion
- CR12 Accidental Fir
- CR13 Drowning

SLAM to be safe

We SLAM. Stop, Look, approach we take to ev trained to SLAM and m for the circumstances.

Promoting team

The happiness, physica of our team is a priority several programmes to

- All our team membe Occupational Health Southern Cross Well annual medical chec of videos, articles ar and well-being
- Our Employment As free, confidential cou
- We undertake mand for all staff and provi
- We provide access t

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and constructive feedback,
ice in relation to our

Director of her own
business strategy, risk and
tive General Manager of
ystems at Pāmu Farms
y for providing leadership
lity and best practice farming
she is responsible for informing
ce Pāmu's strategies,
achieve sustainable business
s, Animal Health, Welfare and
nment, Data, Geospatial and

gic leader, with strong
drive to achieve exceptional
otivated, capable and
nal, with a track record of
g and delivering best practice

nt and is currently a
ental Research Institute at
m is an iwi trustee on the
Trust and the Te Motu-a-
n Puketutu Island where

of the Sustainability Advisory Board. Tim was a long time Environmental Manager for the Waikato-Tainui iwi and an advisor on the Waikato River Treaty Settlement negotiations. Tim was a technical advisor to the Iwi Leaders Group and developed joint management agreements and ministerial accords with local and central government, which promoted sustainability as a core principle.

Tim has represented corporate, government, council, iwi and community interests in the area of resource management and has acted as an independent RMA Commissioner. Tim was a member of Hamilton City's Environmental Sustainability Strategy Leadership Forum and has been an advocate for indigenous sustainability practices and knowledge both in NZ and overseas.

Dr Hugh Logan

Hugh comes with an extensive background in environmental and resource management. He was the CEO of the Ministry for the Environment and the Department of Conservation, and before that headed the New Zealand Antarctic Programme. His experience has been at a central and regional government level (he currently chairs Environment Canterbury's Regional Freshwater Committee). He is steeped in government policy, legislation and regulation development. Of direct relevance to Waste Management was his involvement with the development of the waste minimisation legislation (including the waste levy), nationwide contaminated sites, as well as climate change legislation (including the emissions trading scheme in 2008).

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in 2020 we surpassed our baseline year of 2017 reduction target of 7.5%, reducing our operational greenhouse gas emissions (by intensity using revenue) by 10.6%.

This was partly due to the impact of COVID-19 restrictions on the business, however our ongoing expansion of our EV truck programme also contributed to this reduction. We added seven new EV trucks to our fleet during 2020, despite COVID-19 impacts to the EV truck conversion workshop, bringing our total to 16 trucks.

Emissions against 2019

We achieved a reduction in absolute operational emissions of 5.8% from 61,300 tCO2e in 2019 to 57,789 tCO2e in 2020. Scope 1 diesel use, which made up 69% of our operational carbon footprint in 2020, was reduced by 10% when compared to 2019 figures.

There were two main factors influencing this reduction. First, reduced operations due to COVID-19, for example air travel reducing by 76% and taxi use reducing by 71%. Second, our continuing drive to move towards electric vehicles, which has resulted in a reduction in petrol regular use by 54% from 332 tCO2e to 151 tCO2e, and a petrol premium use reduction of 48%.

Emissions in 2020

Our carbon footprint reduction plan was finalised in 2019 and went into effect during 2020. We do not use carbon offsetting to meet our reduction targets.

Waste Management's Carbon Footprint 2017 to 2020

	2017	2018
Scope 1	160,227	121,771
Scope 2	928	939
Scope 3 Mandatory	26,188	26,497
Total gross carbon footprint	**187,344**	**149,207**

All GHG emission gases are included and the emission factors are defined as per the Toitu Carbonreduce programme.

Waste Management's Operational Carbon Footprint 2017 to 2020

	2017	2018
Scope 1	34,846	34,114
Scope 2	928	939
Scope 3	26,188	26,497
Total gross operational carbon footprint	**61,962**	**61,550**

All GHG emission gases are included, except landfill emissions, and the emission factors are defined as per the Toitu Carbonreduce pro

Waste Management's Intensity Carbon Footprint 2017 to 2020

	2017	2018
Revenue $millions	482.4	504.8

fleet. Direct emissions (Sc
are owned or controlled by

70% of Waste Managemer
landfills, which reflects the
the communities we serve
variable. As we do not dire
generated by communities
plan focuses on reducing
which specifically excludes

Notwithstanding this, Was
on limiting the emissions fr
capture maximum landfill g
electricity. This can be see
ownership at Tirohia Landf
have successfully improve
to 90% resulting in the uni
from 0.7248 tCO2e/t (tonn
in 2018 to 0.119 tCO2e/t i

For transparency we will c
footprint, which includes la

Our base year is 2017, and
used to calculate our carb

Each of our five divisions r
targets along with monthly
our Carbon Footprint Redu
quarter to manage and wo

hip and history

Z Limited is a New Zealand
s headquarters at 318 East
i, Auckland.

ment NZ Limited brand was
pany's history can be traced
.

vas taken in the 1890s, when
was estimated to be around
eginnings of Bryant Cartage,
began trading out of Auckland

l into a diverse range of
ling as wood and coal
contractors and general
Zealand's total imports
7,000,000.

yant Cartage used barges and
rtation on coastal waters and
and cart (as pictured) on land.

and success, and in 1935 was
ed. It was from here that the
waste collection and disposal

mpany had moved away from
hed its focus to the waste
ctivity.

of smaller waste operations,
imited was formed in 1985.
owledge and experience saw
kly become New Zealand's
, recycling and waste
day we are part of the Beijing
pport has allowed substantial
ility, including:

sustainability strategy
recycling facility
uck conversion programme

- Electrification of the Waste Management fleet
- Carbon footprinting down to site level
- Improvements to sustainable landfill technology
- New investments in construction, plastics, bag recycling and several research and development pilots including food waste.

Beijing Capital Group is a global leader in the solid waste, water and environmental protection industries, and Beijing Capital Group Co Limited is the ultimate holding company of Waste Management. We consider our partnership to be an excellent example of constructive and effective Chinese/ New Zealand business relations.

Waste Management is also involved in the following joint ventures:

- 50% ownership of Waste Disposal Services with Auckland Council
- 50% ownership of Transwaste Canterbury Limited with the other 50% owned by Christchurch City Council, and the Hurunui, Waimakariri, Selwyn and Ashburton district councils
- 50% ownership of Midwest Disposals Limited with Envirowaste Services Ltd the remaining 50%
- 50% ownership of Pikes Point Transfer Station with Envirowaste Services Ltd the remaining 50%
- 50% ownership of Daniels Sharpsmart Limited with Cleanaway Daniels Pty Limited the remaining 50%

Waste Management NZ Milestones

1894 Bryant Cartage begins trading out of Auckland

1935 The company gets involved in waste collection and disposal for the

1985 Waste Management NZ Limited is formed

1985 We introduce the first collection truck with an automated lifting arm

1990 Waste Management becomes the largest company in the NZ waste industry

1993 Redvale Landfill & Energy Park opens, setting the standard for excel in modern landfilling

1996 WMNZ enters a joint venture with Living Earth. Today we are NZ's biggest of compost

2014 Transpacific Industries Australia sells Waste Management New Zeala to Beijing Capital Group

2018 WMNZ launches its sustainability strategy For Future Generations

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ve Management Team is responsible for all
, environmental, and social topics.

ste Management New Zealand
0 Executive Organisation Chart

throughout New Zealand, with 1,477 permanent employees, 48 temporary employees and 120 owner-drivers who make up 7% of our team, doing the same work as full-time company drivers but as subcontractors (they own and operate their own collection truck). Owner-drivers' diesel use is included in Waste Management's carbon footprint.

Further detail in Appendix iv: Our team in numbers.

Stakeholder engagement

We have created a stakeholder engagement plan which identifies Waste Management's position on key issues and how we engage with stakeholders.

Our main stakeholder groups are customers, neighbours to our facilities, suppliers, memberships, partnerships, our staff, government departments, local authorities and the media.

Partnerships and memberships

Waste Management has partnerships and is an active member of, or holds accreditation with, a number of organisations:

- Accident Compensation Commission (ACC): Waste Management is accredited as part of the ACC Accredited Employers Programme.
- All Heart NZ: Supports and assists our wider sustainability efforts by providing an additional reuse solution for our customers' unwanted items through practically redirecting and repurposing redundant and unwanted items.
- Climate Leaders Coalition (CLC): We've been a member since 2018. CLC aims to help New Zealand transition to a low emissions economy and create a positive future for New Zealanders, business, and the economy by supporting the Paris Agreement aim to keep the world within two degrees of warming.
- Keep New Zealand Beautiful: A not-for-profit organisation working to keep communities clean, safe and beautiful through campaigns like 'Be a Tidy Kiwi' and 'Do the Right Thing'.
- New Zealand Green Building Council (NZGBC): Supporting sustainable building and construction practices.
- New Zealand Institute of Safety (NZISM): New Zealand's leading professional association for health and safety practitioners.
- Site Safe: Supporting our business health and safety needs.
- Sustainable Business Council (SBC): Working towards a balanced pursuit of economic growth, ecological integrity, and social progress.
- Sustainable Business Network (SBN): Working with other

organisation, requiring annual indepen
our carbon footprint and strategies to
our carbon footprint, meeting ISO 140
Greenhouse Gas Protocol.

- WasteMINZ: New Zealand's largest re
the waste, resource recovery and con

Supply chain

We have approximately 3,000 suppliers
specialise in the provision of industrial g
and services, including commodity indu
and expendables, to highly specialised
products. These suppliers are overwhel
based though some of our equipment d
Europe, America, India, and China.

The services we receive can be complex
with both entry level labour requirements
specialised services. At least 25% of Wa
spend is directly related to labour intensi
many goods and equipment we purchas
ancillary services for maintenance, instal

Due to COVID-19 Waste Management fa
supply issues during 2020, and a number
implemented to reduce supply issues imp

- PPE: Working with our PPE suppliers
brands not previously used. We now a
supply of face masks and gloves at al
good holding of N95 facemasks whic
for a number of our operations. We ha
the sharp increases to prices during t
more stock than previously.
- FlexiBin®: Due to interruptions to glob
of FlexiBin stock reached critical level
2021. Although Waste Management h
of orders to ensure more stock on ha
interruptions to shipping present an o
- Steel Bins: Due to stock issues the pr
steadily increased, price increases ra
this is affecting both our new and refu
bins have not been affected other tha
- General stock: A number of our stock
increased due to the heightened risk
managed at branch level. Our Gas Ge
increased stock holdings of parts and
as well as working with suppliers to h
the country.
- Vehicles: Increased lead time on certa
utes, these have a 6-9 month lead tim
We have extended the leases on a nu

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GRI General Disclosures Index

cordance with the GRI Sustainability Reporting Standards (GRI), applied to a core level of compliance. To achieve core
t at least one disclosure for each material topic listed here. For further information, refer to www.globalreporting.org

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	Description and/or page number
n	Waste Management NZ Limited Pg. 20
oducts and services	About Waste Management – Operations Pg. 18
rters	318 East Tamaki Rd, East Tamaki, Auckland, NZ (Pg. 20)
ns	About Waste Management – Operations Pg. 18
form	About Waste Management – Ownership Pg. 20
	About Waste Management – Operations Pg. 18
tion	About Waste Management – Ownership Pg. 20
oyees and other workers	Appendix iv Team in numbers Pg. 24
	About Waste Management – Supply Chain Pg. 21
o the organisation and its	i. About Waste Management – Operations Pg. 18 ii No changes to report in 2020 iii. No changes to report in 2020
ple or approach	The precautionary principle is not formally used by Waste Management, but the assessment of risk incorporates assessing the significance and likelihood of environmental risks.
	About Waste Management – Memberships Pg. 21
ciations	About Waste Management – Memberships Pg. 21
or decision maker	From our Managing Director Pg. 2
andards, and norms	About Waste Management – Values Pg. 18
e	About Waste Management – Governance Pg. 21
roups	About Waste Management – Stakeholder engagement Pg. 21
agreements	Appendix iv Team in numbers Pg. 24
ting stakeholders	About Waste Management – Stakeholder Engagement Pg. 21
lder engagement	About Waste Management – Stakeholder Engagement Pg. 21
erns raised	About Waste Management – Stakeholder Engagement Pg. 7
he consolidated financial	About Waste Management – Ownership Pg. 20
nt and topic boundaries	Our Report Pg. 3

Disclosure	Name	Description and/or page r
102-49	Changes in reporting	Our Report Pg. 3
102-50	Reporting period	Our Report Pg. 3
102-51	Date of most recent report	Our Report Pg. 3
102-52	Reporting cycle	Our Report Pg. 3
102-53	Contact point for questions regarding the report	Back page
102-54	Claims of reporting in accordance with the GRI Standards	Our Report Pg. 3
102-55	GRI content index	Appendix i GRI General Dis
102-56	External assurance	GRI General Disclosures In
Environmental Topic Disclosures		
305-1	Direct (Scope 1) GHG emissions	About Waste Management -
305-2	Energy indirect (Scope 2) GHG emissions	About Waste Management -
305-3	Other indirect (Scope 3) GHG emissions	About Waste Management -
305-5	Reduction of GHG emissions	About Waste Management -
307-1	Non-compliance with environmental laws and regulations	No significant fines or non-non-compliance.
Social Topic Disclosures		
403-1	Occupational health and safety management system	About Waste Management –
403-2	Hazard identification, risk assessment, and incident investigation	About Waste Management –
403-5	Worker training on occupational health and safety	About Waste Management –
403-8	Workers covered by occupational health and safety management system	Appendix iii Health and Saf
403-9	Work-related injuries	Appendix iii Health and Saf
403-10	Work-related ill health	Appendix iii Health and Saf

Material issues defined

	Description
ers	Waste Management is seen as a company that works proactively to achieve its customers' waste goals.
ers	Collaborating with partner organisations to deliver solutions for customers and for communities.
nity	Waste Management is a strong communicator and advocate, both internally and externally, and is vocal on waste issues in the public domain where it needs to be.
nity	Proactive engagement with local communities over the long-term, e.g. through community committees, youth councils and direct relationships with iwi.
nity	Investment in local communities, particularly in areas that relate to Waste Management, e.g. taking waste from stream/waterway clean-ups in partnership with iwi and/or organisations such as Sustainable Coastlines.
s	Ensuring full legal compliance at all times, and proactively marketing this to large customers.
ers	Relationships and reporting are of a consistently high standard. Best practice is identified and implemented company-wide (where appropriate).
	Staff are proud of working for Waste Management and share their knowledge of the waste industry with those outside the company; internal collaboration to improve outcomes.
ers	Creating a positive experience for all customers, e.g. a focus on delivering solutions, having helpful front-line staff, having well-maintained trucks and courteous drivers.
ers	Waste Management moves towards partnerships (rather than transactional relationships) with key customers throughout New Zealand, focused on achieving their sustainability goals and targets.
	Waste Management has an inclusive culture and working practices with diversity (in gender, race, age, etc.) at all levels of the company.
nity	Raising awareness of how waste is treated in New Zealand by sharing knowledge with staff, customers, schools, communities and government. Delivered through videos, infographics, brochures, teaching materials, site open days, social media, etc. This would tell the story of waste, including recycling, composting, landfill and speciality waste streams (e.g. hazardous waste and e-waste).
	Waste Management is seen as an employer of choice.
ment	Environmental issues are used as a lens through which all major decisions are assessed, focusing on greenhouse gas emissions, energy, water, direct discharges and biodiversity.
	Health and safety remains a top-tier priority for Waste Management.
s	Waste Management leads the waste sector in innovation, e.g. through electric trucks, generating energy from landfill gas, low carbon waste solutions, and new waste processing technologies.
s	Waste Management is genuine, ethical, acts with integrity and walks the talk.
	Internal systems are robust and clearly documented (e.g. do not rely on individuals). Visibility of performance against KPIs (site and company). Data is

Disclosure	Name	Description and/or page r
Investment in people	**Our People**	Waste Management invests in training and developm levels, from front-line staff to supervisors to technical
Leadership on waste	**Our Community**	Proactive engagement with central and local governr leadership of the wider waste industry.
Long-term profitability	**Our Business**	Waste Management is a profitable business over the
Regional waste solutions	**Our Business**	Landfill/recycling/composting solutions to suit differe waste locally and profitably.
Reporting on-demand and on actual weights	**Our Business**	Reporting is based on actual weights (not estimates) through live reporting and interactive portals) and inc alongside other key metrics.
Social licence to operate	**Our Business**	Waste Management is a net-positive business with a operate, e.g. through actively restoring ecosystems (plastic waste) or by extending the "landfill as an ener first with waste-to-energy and then installing solar/wi site, providing a long-term income for the landfill onc
Transparency	**Our Customers**	Waste Management is transparent and honest, e.g. is cannot be recycled for a technical/economic reason being worked on), provides advanced notice of expe landfill fees, etc.
Waste minimisation is core business	**Our Business**	Waste Management makes waste minimisation and l and part of its core business.

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Health & safety results

-related ill health events, we combine statistics for work-related injuries and illnesses together.

e health and safety results:

	Count	Rate
ted injury or ill health	0	0
injuries or ill health	1 (Lost Time Injuries - LTI)	LTIFR = 0.3
or ill health	334 (First Aid Treatments (FAT) = 342, Medical Treatment Injuries (MTI) = 7)	MTIFR = 1.2 TRIFR = 1.5
ed injury or ill health	180 soft tissue injury (strains/sprains)	-
	3,398,404 hours	-

requency Rate
e rolling period x 1 million / the rolling period hours worked

Rate
e rolling period x 1 million / the rolling period hours worked

quency Rate. TRIFR is the sum of LTI + MTI
s and MTIs for the rolling x 1 million / the rolling period hours worked

gement 2020 owner drivers
tors health and safety results

	Count
ted injury or ill health	0
injuries or ill health	1 (Lost Time Injuries = LTI) 4 (Medical Treatment Injuries = MTI)
or ill health	46 (First Aid Treatments = FAT)
ed injury or ill health	Sprains/Strains
	N/A – we do not record contractor hours

n 1,000,000 hours worked.

Appendix iv: Team in numbers

Table 1: Total number of team members by employment type

Employment Type	Total
Permanent Contract	1477
Temporary Contract	48
Owner Driver	120
Total	1645

Table 2: Total number of employees by employment contract (permanent and temporary), by gender

Employment contract	Male	Female	Total
Permanent	1090	387	1477
Temporary	29	19	48
Total	1119	406	1525

Table 3: Total number of employees by employment type (full-time and part-time), by gender:

Employment contract	Male	Female	Total
Full-time	1063	359	1422
Part-time	26	29	55
Total	1089	388	1477

7.4% of WM's total employees are covered by collective bargaining agreements.

Note, this data was compiled from our payroll system.

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Appendix D

Corporate Health and Safety Policy

Health and Safety Policy

1.0 Objectives

As a Person Conducting a Business or Undertaking, (PCBU), Waste Management NZ Limited and its subsidiaries ("WM"), are committed to the safety, health and wellbeing of our workers. We believe that all workplace related incidents, injuries and illnesses are preventable and aspire to achieve our aim of "Zero Harm" by making health and safety the first priority in all our business activities. We also believe that attaining the highest standards in health and safety is paramount to the success and sustainability of our business.

2.0 Waste Management achieves these objectives by:

a) Expecting all workers and contractors to cease work if they feel unsafe, or are exposed to health risks;

b) Consulting with workers and relevant stakeholders in the decision-making processes impacting on workplace health and safety;

c) Complying with all legal requirements in accordance with The Health and Safety at Work Act 2015, codes of practice and standards applicable to our activities;

d) Ensuring our systems and processes effectively support the business and our workers to work in a healthy and safe environment;

e) Demonstrating visible safety leadership through our supervisors, managers, and Directors;

f) Identifying and understanding the hazards and risks relevant to the activities we undertake and provide effective controls to assess, and manage them accordingly;

g) Providing appropriate training and support to our workers and contractors to enable them to understand our vision of "Zero Harm", and to allow them to perform their roles competently in line with the health and safety expectations,

h) Setting objectives, targets and key performance indicators which continually drive us to improve our health and safety performance;

i) Learning from our performance and continuously improving our processes and work practices; and sharing lessons learnt with others;

j) Ensuring that all incidents are investigated fully - specifically identifying the causal and contributing factors so that appropriate corrective actions are taken;

k) Identifying Critical Risks and ensuring these are actively managed;

l) Regularly undertaking audits and inspections of our operations; and

m) Communicating this Policy to workers and interested stakeholders; and reporting on our health and safety performance openly and transparently.

3.0 All Officers (Executive Management Team) are required to:

a) know about workplace health and safety matters and keep up-to –date;

b) gain an understanding of the operations of the organisation and the hazards and risks generally associated with those operations;

c) ensure the PCBU has appropriate resources and processes to eliminate or minimise those risks;

d) ensure the PCBU has appropriate processes for receiving information about incidents, hazards and risks, and for responding to that information;

e) ensure there are processes for complying with any duty, and that these are implemented;

f) verify that these resources and processes are in place and being used.

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4.0 All Persons in control of a workplace (Regional Manager, Branch Manager, Supervisor) are required to:

a) Take all practicable steps to ensure the health and safety of all workers while at work;

b) Ensure that all workers are trained and competent to perform their tasks in line with the company's health and safety processes, procedures, and expectations;

c) Ensure all HSEQ systems are implemented and followed at all times;

d) Ensure all workers are able to perform their duties in a health and safe manner (e.g., access to appropriate resources, well maintained plant and equipment, and Personal Protective Equipment ("PPE") relevant to the task; and

e) Support WM in achieving its objectives set out in Section 2 of this Policy

f) have a clear understanding or risk and change management and risk identification.

g) support workers in their understand and application of risk management

5.0 All Workers and Contractors are required to:

a) Carry out their work in accordance with WM's safety policies, processes and procedures;

b) Be accountable for their own health and safety, that of others, and ensure their actions or inactions do not create health and safety risks to others;

c) "SLAM" – Stop, Look, Assess and Manage the hazards and risks inherent to the activities they undertake;

d) Comply, so far as reasonably able, with any reasonable instruction that is given to them by the PCBU to allow the PCBU to comply with the law;

e) Stop work if they feel unsafe or exposed to health risks; and

f) Immediately report any hazards or identified risks and all incidents which cause actual or potential injury, health related issues or damage.

6.0 Worker Health and Wellbeing

a) Employed workers will be offered and encouraged to have an annual health assessment at WM's cost which may include health monitoring in relation to identified work risks and a general health assessment for the Employee's benefit.

b) The employed worker will receive all health assessment results. WM will not receive any personal information relating to individual health assessment results, with the exception of health monitoring of work-related hazards.

c) Non-permanent workers will be assessed, dependant on the task they are completing for WM. Where the task has a potential risk to a worker's health and wellbeing, this will be discussed and reviewed accordingly.

7.0 Children in the Workplace

a) Due to the nature of our work and risks involved, children under the age of 15 are not allowed to be brought in to the workplace under any circumstances. Children over the age of 15 can attend a place of work if enrolled in a recognised work experience programme.

b) Where workers are required to look after a child / children due to unforeseen circumstances during work hours, carers leave or annual leave are provided as an option, or workers may be allowed to work from home only with approval from a Level 3 manager.

c) If a worker is on parental leave and would like to attend a workplace to introduce their child to fellow workers, this must be approved by their reporting manager first. The parent or child must not enter operational areas due to risk.

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d) Open days or pre-arranged site visits that may involve children attending, must be approved by the relevant divisional General Manager who will nominate a worker/s to be responsible for the safe management of the open day or site visit and ensure safety requirements are met.

8.0 Application

This Policy applies to all workers, contractors and joint venture partners engaged in activities under WM's operational control.

9.0 Breaches of policy

Any breach of this Policy, including breaches of local procedures, may result in disciplinary action, with potential of formal outcomes up to and including instant dismissal.

This Policy will be reviewed annually.

s7(2)(a) [redacted]

Appro

Date: 17 November 2021

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Appendix E

Silverstream Site Risk Register

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Waste Management

Task/activities Risk Register - Active Tip Face

Date updated 26-May-22

Area of Risk	Identified Risk	WM Critical Risk Yes / No	Likelihood	Consequence	Risk Rating	Eliminate or minimise	Current Controls	Likelihood	Consequence	Risk Rating	Risk Owner	Date Reviewed	Additional controls required
			Uncontrolled Risk Rating					Controlled Risk Rating					
All activities	Drug & Alcohol or psychological stressors impairing performance and judgement resulting in injury	Yes	5	4	21	Administrative	Drug & Alcohol Policy; Drug & Alcohol Detection Regime (Pre employment, Just Cause, Post Incident & Random - 10% per month); EAPWorks	1	4	16	Branch Manager	May-22	
	Fatigue impairing performance and judgment resulting in injury	Yes	5	4	21	Administrative	Fatigue management, Training, Regular breaks, Smoko facilities, Awareness campaigns	1	4	16	Branch Manager	May-22	
	Contractors & Labour hire staff failing to follow procedures causing injury, fatality & property damage. HCC contractors (T&T plus their contractors & sub contractors) not following WM induction procedures.	Yes	5	5	25	Administrative	WM Contractor Management procedures (QRG); Pre qualifications; Authorised contractors; Inductions; Work permits & Authorities. Online Contractor Induction	1	5	19	Branch Manager	May-22	
Adverse weather	High wind, rain or flooding causing injury	No	4	3	14	Administrative	Stop work following heavy rainfall or greasy surfaces; wet weather gear; mobile plant operators in purpose built machine cabs	1	3	11	Branch Manager	May-22	
Bird Scarer	Pyrotechnic shot launcher failure causing deafness or other injury	No	3	4	18	Administrative & PPE	Trained operators; work instructions; PPE;	2	3	12	Branch Manager	May-22	
Entry & exit to cabs	Slip Trip Fall while exiting/entering mobile plant causing injury	No	5	4	21	Engineering & Administration	Three points of contact; trained operators; work instructions; JSEAs; purpose built plant (hand grips & steps); hand rails Housekeeping	1	4	16	Branch Manager	May-22	
Exposure to hazardous substances (diesel)	Exposure to hazardous substances (diesel) during mobile plant re fueling causing injury or illness	Yes	5	4	21	Administrative & PPE	Trained operators; work instructions; PPE; SDS, Diesel Tank Certification, Pre start checks on equipment	1	4	16	Branch Manager	May-22	
Exposure to hazardous substances (asbestos or special waste)	Intentional or unintentiional disposal	Yes	5	4	21	Administrative & PPE	Work instructions; PPE; Asbestos Management Plan; trained operators; purpose built plant with enclosed cabs	1	5	19	Branch Manager	May-22	
Exposure to hazardous waste	Exposure to waste hazardous substances and hazardous waste causing injury, illness or fatality	Yes	5	5	25	Engineering, Administrative & PPE	Acceptance criteria (no special burials in active tip face); trained operators; work instructions; PPE; restricted area; purpose built plant with enclosed cabs	1	5	19	Branch Manager	May-22	

Exposure to landfill gases	Exposure to landfill gases (Methane, Carbon Dioxide, Nitrogen, Oxygen, Hydrogen Sulphide, Carbon Moinoxide, Non-Methane Organic Compounds) causing injury, illness or fatality	**Yes**	5	5	25	Engineering, Administrative & PPE	Purpose built plant with enclosed cabs; natural ventilation; gas detection; gases extraction; SOP. Gas monitoring regime; Contractor Management & Inductions (non WM contractors)	1	5	19	Branch Manager	May-22	
Exposure to sun	Exposure to high levels of UV rays causing injury or illness	**No**	5	4	21	Administrative	Operators in purpose built plant with enclosed cabs; sunscreen; PPE (sun protection); work instructions	1	4	16	Branch Manager	May-22	
Fire	Fire initiated on active tip face (deliberate or spontaneous); fire on moblie plant (engine bays)	**Yes**	5	5	25	Administration	SEMP; experienced landfill operators (manager & supervisor); fire extinguishers, fire suppression units on mobile plant; trained operators. Fire extinguisher training	1	5	19		May-22	
Handling Sharps	Contact with sharp edges, broken glass, etc during product distruction causing injury.	**No**	5	4	21	Administrative & PPE	Work instructions; PPE - high spec gloves	1	4	16	Branch Manager	May-22	
Hazardous manual tasks	Lifting, bending, stretching, pulling, pushing, twisting, sustained force or repeatative movements causing discomfort, pain or injury (DPI)	**No**	5	4	21	Engineering & Administration	Manual handling techniques; training; mechanical lifting devices; work instructions	1	5	19	Branch Manager	May-22	
Hot surfaces	Contact with hot surfaces on mobile plant causing injury	**No**	5	4	21	Engineering, Administrative & PPE	Purpose built mobile plant (body panels); Trained operators; work Instructions; PPE	1	4	16	Branch Manager	May-22	
Incompatibles, Fire	Incompatible substances causing reaction (fire or toxic fumes)	**Yes**	5	5	25	Engineering, Administrative & PPE	Trained operators; fire fighting equipment; SEMP; Emergency wardens; PPE; purpose built plant with enclosed cabs	1	5	19	Branch Manager	May-22	
Litter Control	Lifting, bending, stretching, pulling, pushing, twisting or repeatative movements causing discomfort, pain or injury (DPI); Slip trip fall hazard on slipperyor uneven surfaces;	**No**	5	4	21	Engineering & Administration	Manual handling techniques; training; mechanical lifting devices; work instructions	1	4	16	Branch Manager	May-22	
Noise	Noise above 85dB over 8 hours or 140 dB causing Noise Induced Hearing Loss (NIHL)	**No**	3	4	18	Administrative & PPE	Noise survey; PPE - hearing protection when working in the proximity of mobile plant for continous 8 hours;	1	4	16	Branch Manager	May-22	
Operating mobile plant (excavators, bulldozers, compactors, front-end loaders, terex)	MVA or entrapment causing injury or fatality	**Yes**	5	5	25	Administrative	Trained operator; licenced operators (WT); work instructions; drive to the conditions; stop work in extreme weather conditions; TMP; speed limits;	1	5	19	Branch Manager	May-22	
Pedestrian/vehicle interaction	Uncontrolled pedestrians & vehicles colliding causing injury or fatality	**Yes**	5	5	25	Administrative & PPE	Traffic management plan (TMP); speed limit (30kph); access control; hi vis vests or overalls; beacons; licensed drivers; trained operators & drivers; site induction; contractor & visitor management; give way policy (pedestrians to give way to vehicles); 5 Metre Rule; signage	1	5	19	Branch Manager	May-22	
Pinch & crush points	Pinch and crush points on mobile plant causing injury or fatality	**Yes**	5	5	25	Administrative & PPE	Work instruction; trained operators; Lock out/Tag Out (LOTO);	1	5	19	Branch Manager	May-22	

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Poor hygiene	Biological exposure causing illness	**Yes**	5	3	15	Administrative & PPE	Personal hygiene; anti bacterial soaps or hand sanitisers; clean towelling; clean overalls; overalls cleaned daily; shower facilities; PPE; Pre employment medicals; health monitoring; Hep A & B plus Tetanus shots	1	3	11	Branch Manager	May-22	
Reversing vehicles	Reversing vehicles causing injury or fatality	**Yes**	5	5	25	Administrative & PPE	Traffic management plan (TMP); reversing cameras; reversing beepers; reversing lights; beacons; licensed drivers; trained operators & drivers; hi vis vests or overalls; spotters when required; site induction; contractor management; 5 Metre Rule; RT Communciation	1	5	19	Branch Manager	May-22	
Spills/leaks	Mobile plant leaking (hydralic fluids, oils, radiator water) causing spills to the environment	**No**	5	3	15	Administrative	Clean up spills immediately; spill kits; training	1	3	11	Branch Manager	May-22	
Traffic & other road users	Traffic incidents or accidents causing injury or fatality to staff and/or puiblic	**Yes**	5	5	25	Administrative	Licensed drivers; trained operators; Road Code; Drive to the conditions; Signage	1	5	19	Branch Manager	May-22	
Uncontrolled sources of energy	Contact with uncontrolled sources of energy causing injury or fatality	**Yes**	5	5	25	Administrative	LOTO procedure; trained operators; work instructions;	1	5	19	Branch Manager	May-22	
Uneven surafces & gradients	Uneven, greasy or wet surfaces resulting in Slip Trip Fall causing injury	**Yes**	5	4	21	Administrative	Trained operators; worki nstructioons; pedestrians to walk not run; PPE (wear gloves and ankle supported safety boots); mobile plant to work at maximum 3:1 gradient; stop work following heavy rainfall & greasy surfaces	1	4	16	Branch Manager	May-22	
Vehicle/vehicle interaction	Uncontrolled vehicles (including trucks, mobile plant & utes) colliding causing injury	**Yes**	5	4	21	Administrative	Traffic management plan (TMP); speed limit; access control; beacons; licensed drivers; trained operators & drivers; site induction; contractor & visitor management; 5 Metre Rule	1	4	16	Branch Manager	May-22	

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Appendix F

Silverstream Site Emergency Management Plan

WASTE MANAGEMENT NZ LIMITED

Silverstream Landfill

EMERGENCY MANAGEMENT PLAN

WM LNI SIL PL 1004 REV 7

ADDRESS: Reynolds Bach Drive, Silverstream, Upper Hutt

TELEPHONE: s7(2)(a)

BRANCH MANAGER: s7(2)(a)

TELEPHONE: s7(2)(a)

EMERGENCY CONTROLLER: s7(2)(a)

TELEPHONE: s7(2)(a)

Note- Limited Cell Phone coverage on the site! RT Used for internal communication.

Prepared by: - s7(2)(a)

Date: April 2022

Review due: April 2022 or within 3 months following significant change in process or procedure

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Section 1 – Details and Communication

Branch Activities

Activities undertaken at the Branch	Landfill Transfer Station Limited waste hazardous substances receipts Special burials including Asbestos
Property Size (total)	109ha
Number of personnel	21
Number and description of buildings	Kiosk Administration/Office Complex Storage Sheds
Location of site chemical manifest	Office
Location of the site asbestos register	Manager's office (asbestos burials only)

Neighbouring Facilities

Neighbouring Facility	Contact Person & Number	Mechanism for raising alarm	Circumstance for raising alarm
Landfill gas powered generation plant (LMS)	s7(2)(a) [redacted]	Phone/physical	Fire/explosion
Local residence	HCC Emergency Management – s7(2)(a) [redacted]	FM Radio/physical/phone	Fire/explosion
Silverstream Retreat	s7(2)(a) [redacted]	Phone/physical	Fire/explosion, Flooding

Site Emergency Response Team Contact List

Position	Name	Contact	
		Site	After Hours/Mobile
Emergency Controller	s7(2)(a) [redacted]		
Deputy Emergency Controller			
Area Warden			
Area Warden			
First Aider			
First Aider			
First Aider			
First Aider			
First Aider			
First Aider			

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External Emergency Contacts

Service Provider	Name	Work Number
Police / Fire / Ambulance	**Telephone 111 Fixed line and Mobile telephones**	
Crisis Counsellor	EAPWorks	s7(2)(a)
Company Medical Practitioners	s7(2)(a)	
	Hutt Hospital	
	Onslow Medical Centre	
WHS Regulatory Authority	WorkSafe NZ s7(2)(a)	
Environmental Regulatory Authority	Greater Wellington Regional Council (GWRC) s7(2)(a)	
Poisons Information Centre	New Zealand	s7(2)(a)
Electrical Authority	Trust Power s7(2)(a)	
Water Services Authority	Hutt City Council s7(2)(a)	
Gas Services Authority	N/A	
Local Regulatory Council/s	Hutt City Council s7(2)(a)	
Civil Defense	s7(2)(a) or http://wellington.govt.nz/about-wellington/emergency-management	
Other	MetService s7(2)(a) or http://metservice.com/national/home	

Section 2: Emergency Equipment Register

Response Equipment	Type of Part	Location	Signage
Fire Fighting	Fire extinguishers	All mobile plant	Yes
		Office & kiosk	Yes
		Storage shed	Yes
First Aid	First aid kits	All mobile plant	No
		Office & kiosk	Yes
	Eyewash kits	First aid kit office	Yes
	Emergency Shower	Office bathroom	No
	Defibrillator	Office entry	Yes
Spill Response	Spill kit 240 litre	Office	Yes

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Section 3: Emergency Preparedness & Response

Identify Emergency Type and Risk Rating

On Site	Emergency Type	Likelihood	Consequence	Rating
	Fire/explosion	Possible	Significant	Extreme (23)
	Medical Emergency	Possible	Moderate	High (18)
	Personal Threat	Rare	Moderate	Medium (11)
	Spill/Environmental	Possible	Minor	Medium (8)
	Gas Leakage	Possible	Major	High (18)
	Natural Events- Earthquake flood etc	Rare	Major	High (16)
	Entrapment	Rare	Significant	High (19)

*For each emergency identified above, prepare a response plan for each and attach as Appendix 1.

Section 4: Training

All personnel shall be provided with general Emergency Awareness Training as part of the induction process and within 6 months of their employment, and will cover at a minimum;

- Location of all emergency equipment and training in its use (if required);
- Provide awareness of the types of emergencies that may occur at this site and appropriate response plans for these.

Personnel who have assigned emergency team responsibilities shall be provided with additional Emergency response training specific to their roles and responsibilities. This must be included in the Training needs analysis and on the training matrix.

Section 5: Raising the Alarm

In the event of an emergency at this site the following range of communications systems shall be utilised, as appropriate:

- Use of RT and landline (limited mobile phone coverage)

Section 6: Testing and Recording Drills

The implementation of this plan shall be physically tested on a minimum 6 monthly basis.

All implementation tests (or drills) shall include, but not be limited to, the following aspects;

- Activation of the emergency alarm/s;
- Evacuation of all areas on site, including timing of evacuation times
- Include a variety of scenarios applicable to this site i.e spills, threats, explosion etc.

Drills are conducted and then evaluated using ***Emergency Drill Debrief Form***. A record shall be kept at site and date and time of Drill recorded in the Vault (Risk Management Module, Emergency Management, Checks and Registers, Facility/Site Evacuation).

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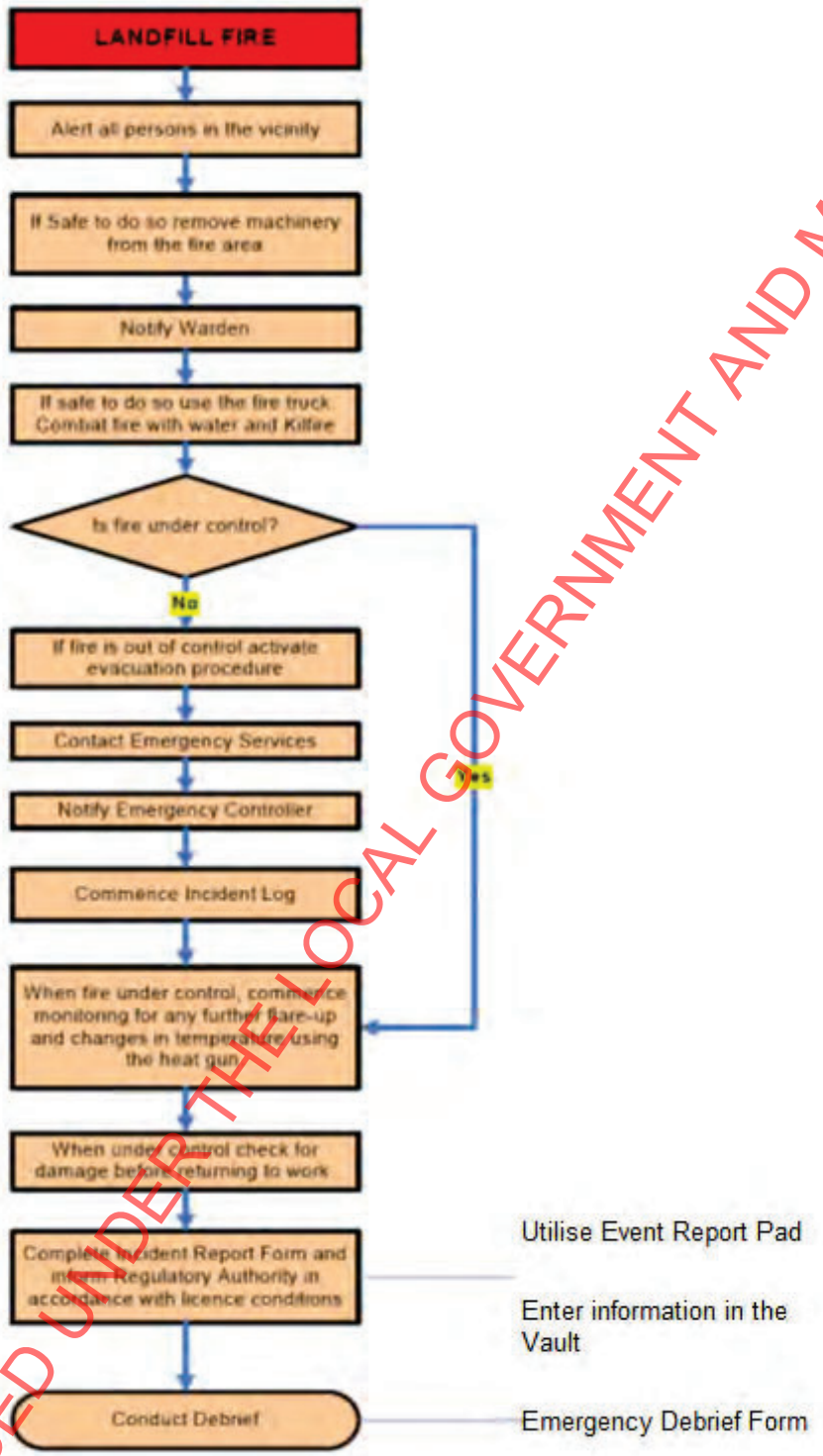
Appendix 1: Emergency Response Guidance

Fire/ Explosion Response



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Fire - Landfill Surface

1. If the fire appears too large to handle, call the fire service straight away **111.**

2. Assume fumes are toxic. Stay out of the path of wind-blown smoke.

3. Put on protective gear if appropriate (RPE in water cart).

4. Identify the load or area on fire if possible. Warn others by site radio and call for assistance.

5. Use fire extinguishers if appropriate.

6. Also if necessary, use the water cart to spray water on the seat of the fire and use excavator to allow access to smouldering area, Exhume the burnt refuse in small sections.

7. Use machines to push nearby loose, flammable rubbish etc out of the way if this can be done safely.

8. If these methods are unsuccessful, call for assistance from the Fire Service, dial 111.

9. Spray water on any fire which re-appears using the water cart, or if appropriate fire extinguishers. Fire-fighting reserve water can be obtained from onsite water fill point at the Bore Water Pond.

10. Call for back-up fire extinguishers to be made ready.

11. Reconstruct the refuse cell to proper thickness with cover.

12. If a deeper landfill fire is apparent, design and implement a strategy to eliminate air entry to the refuse around the area of the fire which may include:

    - Foam cover (NZ Fire Service)
    - Use excavator to dig out soakage wells
    - Check and seal leachate cleanout risers (WM)
    - Inject inert gas (BOC Gases)

13. Arrange for fire extinguishers to be refilled.

14. All fires must be reported to the relevant authorities as soon as possible.

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Fire - Landfill Sub-surface

1. If the fire appears too large to handle, call the fire brigade straight away.
2. Assume fumes are toxic. Stay out of the path of wind-blown smoke.
3. Warn others by site radio and call for water cart and assistance.
4. Move vehicles away so that they don't fall into collapsing refuse
5. Put on protective gear as required.
6. Use machines to push nearby loose, flammable rubbish etc out of the way **ONLY** **if this can be done safely.**
7. Identify the load or area on fire if possible by visual inspection.
8. Monitor all surrounding gas wells for carbon monoxide and temperature.
9. Inspect the landfill surface and determine sources of air entry.
10. Use fire extinguishers and water on likely points of air entry.
11. Shut down the gas extraction system in wells showing elevated CO and temperature.
12. Reduce the vacuum in adjacent wells.
13. Call for back-up fire extinguishers to be made ready.
14. Wherever fire breaks out at the surface, spread cover soil and spray water to smother the fire using the water cart. Fire-fighting reserve water can be quickly obtained from hydrants at the workshop or wheel wash.
15. If these methods are unsuccessful, call for assistance from the Fire Service, dial 111.
16. Design and implement a strategy to eliminate air entry to the refuse around the area of the fire which may include:
    - Foam cover (NZ Fire Service)
    - Isolate nearest gas extraction wells (WM)
    - Drill injection wells
    - Check and seal leachate cleanout risers (WM)
    - Inject inert gas e.g. liquid CO_2 or N_2 (BOC Gases)
17. Repair identified points of air entry.
18. Reconstruct the refuse cell to proper thickness with cover.
19. Arrange for fire extinguishers to be refilled.
20. Reintroduce gas extraction gradually over 3 days while monitoring the gas composition.
21. All fires must be reported to the relevant authorities as soon as possible by senior management

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Fire - Landfill Gas From Well, Pipe or Ground

If gas escaping from a well, a pipe or the ground is burning.

1. Turn off gas supply or crush burning pipe, only if it safe to do so.
2. Turn off all nearby machines and motor vehicles. Turn off diesel machines.
3. Raise the alarm. Notify the Landfill Manager.
4. Advise the Landfill Gas Technician.
5. Call the Fire Service, dial 111.
6. Clear the area of people.
7. Test air quality - gas technician to use their own testing equipment.
8. Trained firemen are to enter the area only with full respiratory equipment to assess the cause.
9. Call the Police if neighbours could be affected. Evacuate down-wind if appropriate.
10. Perform repairs. Safety is paramount.
11. Do not enter the area. The Fire Service is to be in control.
12. All fires must be reported to the Relevant Authorities by Senior Management as soon as possible.

If there is a fire on the refuse itself:

13. Refer to FIRE - LANDFILL SURFACE in this Emergency Management Plan (Page 6)

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Non-Landfill Fire

All attempts to respond to an emergency situation should at all times ensure personal safety and only be attempted if within the capabilities of the individual.

Upon discovering a Fire, the First Responder should:

- Alert and evacuate nearby personnel located in the vicinity of the affected area.
- Immediately notify appropriate personnel and emergency services (if required).
    - When contacting emergency services, state the following:
    - Your name
    - Company name
    - Type of incident
    - Address of incident and nearest cross street, state and suburb
    - Types of injuries
    - Any other relevant information
- Where safe shutdown plant as per shutdown procedure.
- Where safe isolate power source and ignition sources.
- Stay in communication until told otherwise.
- Attempt to contain, control and extinguish the fire (if safe and you are trained to do so).
- Raise the alarm and proceed with evacuation if necessary.
- Ensure the safety and well-being of personnel and attend to the injured.
- Secure the scene and assist external emergency services.
- Institute a roll-call of personnel, contractors and visitors.

Terminating Emergency:

- After all clear is given from emergency services and Chief Warden.
- Chief Warden in conjunction with site management to debrief staff.
- Controlled / Orderly return to work.
- Damaged and affected areas to be barricaded or locked out until repairs are carried out.
- Ensure preservation of evidence and provide cooperation with statutory investigations.
- Notify local authorities including EPA, Local Council, Health Department, Work Safe NZ (where required).

Explosion

All attempts to respond to an emergency situation should at all times ensure personal safety and only be attempted if within the capabilities of the individual.

Upon discovering an explosion threat, the First Responder should:

- Alert and evacuate nearby personnel located in the vicinity of the affected area.
- Immediately notify appropriate personnel and emergency services (if required).
    - When contacting emergency services, state the following:
    - Your name
    - Company name
    - Type of incident
    - Address of incident and nearest cross street, state and suburb
    - Types of injuries
    - Any other relevant information
- Where safe shutdown plant as per shutdown procedure.
- Where safe isolate power source and ignition sources.
- Stay in communication until told otherwise.

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- Raise the alarm and proceed with evacuation if necessary.
- Ensure the safety and well-being of personnel and attend to the injured.
- Secure the scene and assist external emergency services.
- Institute a roll-call of personnel, contractors and visitors.

Terminating Emergency:

- After all clear is given from emergency services and Chief Warden.
- Chief Warden in conjunction with site management to debrief staff.
- Controlled / Orderly return to work.
- Damaged and affected areas to be barricaded or locked out until repairs are carried out.
- Ensure preservation of evidence and provide cooperation with statutory investigations.
- Notify local authorities including EPA, Local Council, Health Department, Work Safe NZ (where required).

Medical Emergency

All attempts to respond to an emergency situation should at all times ensure personal safety and only be attempted if within the capabilities of the individual.

- Check for threatening situation and remove persons from danger if required.
- Remain with the casualty and provide support.
- Immediately call for assistance.
- Where required, call emergency services - 111.
- When contacting emergency services, state the following:
    - Your name
    - Company name
    - Type of incident
    - Address of incident and nearest cross street, state and suburb
    - Types of injuries
    - Any other relevant information
- Stay in communication until told otherwise
- If conscious, try to ascertain what condition the affected person is suffering.

External Emergency impacting on Premises

All attempts to respond to an emergency situation should at all times ensure personal safety and only be attempted if within the capabilities of the individual.

- Make the area safe.
- Contact Emergency Services if necessary;
- When contacting Emergency Services, state the following:
    - Your name
    - Company name
    - Type of incident
    - Address of incident and nearest cross street, suburb, town/city.
    - Types of injuries, property damage or environmental harm sustained
    - Any other relevant information
- Stay in communication until told otherwise.
- Implement any other applicable emergency procedure.

Terminating Emergency:

- After all clear is given from emergency services and Chief Warden
- Chief Warden in conjunction with site management to debrief staff

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- Controlled / Orderly return to work
- Damaged and affected areas to be barricaded or locked out until repairs are carried out
- Ensure preservation of evidence and provide cooperation with statutory investigations.

In the event of a Spill or Environmental incident

1. *Incident Identified*

It is the responsibility of each worker to be vigilant in the recognition of potential environmental conditions that may lead to environmental incidents. On identification contact the appropriate Emergency services – dial 111.

2. Can the Incident be contained locally?

In determining whether the incident can be contained locally, employees involved must consider the risks to personal health and safety, protection of plant and property and protection of the environment including blocking drains, covering pits and stopping any product entering the sediment ponds. If there is any doubt as to local containment, the appropriate Emergency Services must be called.

3. Call Emergency Services

In the event of an incident that is beyond local containment capability, notify the emergency services. If required by legislation, WM (through National HSE Manager and Environmental Specialist) will notify the relevant government authorities of the incident, including how the incident occurred, measures that have been undertaken to rectify the situation and any impacts that the incident has had on the environment. Government Authorities to be notified are:

- Local Council
- Health Department
- Fire and Rescue
- Work Safe NZ

4. Employ Containment Procedures

Once an incident has been identified, all efforts must be undertaken to contain and minimise the effect of the incident on the environment. This can be achieved by isolating the cause and erecting suitable barriers to prevent the spread or flow of the particular incident.

In most cases there are actions to isolate or eliminate the cause:

- In the case of punctured drum it can be rolled over so that the puncture is on the top
- In the case of fallen drum leaking from the top it can be stood back up
- Move the drum/container to a restricted area to prevent spill entering stormwater
- Broken/damaged pipe may be stopped by closing up-stream valve or shutting down a pump.

Protect the stormwater system/ sediment ponds wherever possible. Should a product reach the stormwater system, go to the next drain in the sequence and check if the spilt product has reached it. If it has, go to the next drain in the sequence until there is no evidence of the spilt product. Block the outlet of this drain and clean the contaminated stormwater.

5. *Notify the Branch Manager*

Every environmental incident must be reported to the Branch Manager as soon as is practically feasible; no matter how insignificant the incident may appear. The Branch Manager is required to contact & liaise with the Environmental Specialist.

6. *Instigate Clean-up and Rehabilitation*

The Branch Manager has the responsibility of coordinating the clean-up and rehabilitation of the affected site to an acceptable standard. All waste shall be segregated where possible and stored and disposed appropriately, contact the Environmental Specialist as required.

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- For external spills – please complete the ***External Spill Response Checklist***

Natural Events

In the event of a flood, severe storm, earthquake, bushfire:

- If safe to do so shut down plant as per shutdown procedure and isolate any other power, gas, water sources.
- Contact Emergency Services if necessary;
- When contacting Emergency Services, state the following:
  - Your name
  - Company name
  - Type of incident
  - Address of incident and nearest cross street, state and suburb
  - Types of injuries, property damage or environmental harm sustained
  - Any other relevant information
- Stay in communication until told otherwise.
- Implement any other applicable emergency procedure.

When the natural event occur outside hours, where safe to do so the Chief Warden or their representative should visit the site to isolate any power, gas and water sources and provide access to emergency services where required

Personal Threat

In the event of a civil disturbance:

- Ensure your Chief Warden is notified immediately
- Notify the Police by dialing “111” and request assistance
- Do not say or do anything that may encourage irrational behaviour
- Remove any objects in accessible locations that could be used as weapons or missiles by aggressive trespassers
- Alert other personnel in your vicinity of the threat
- Evacuation should be considered (if safe to do so)

Gas Leakage

In the event of a Gas Leak:

- Isolate the Gas supply at the source (if safe to do so)
- Notify the Emergency Services by dialing “111”
- Shutdown the air conditioning to prevent the spread of any flammable or toxic gases
- Remove any ignition sources (if safe to do so)
- Evacuate to safe area and contact the Branch Manager
- Await advise from emergency services
- If Branch Manager not on site, advise the Branch Manager of outcome.

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Entrapment

In the event of a trapped person:

All attempts to respond to an emergency situation should at all times ensure personal safety and only be attempted if within the capabilities of the individual.

- Ensure the area is safe, and any machinery or equipment remains in place and is switched off with keys removed
- Remain with the casualty and provide support
- Immediately call for assistance
- Call emergency services - 111
- When contacting emergency services, state the following:
    - Your name
    - Company name
    - Type of incident
    - Address of incident and nearest cross street, state and suburb
    - Types of injuries
    - Any other relevant information
- Stay in communication until told otherwise by emergency services

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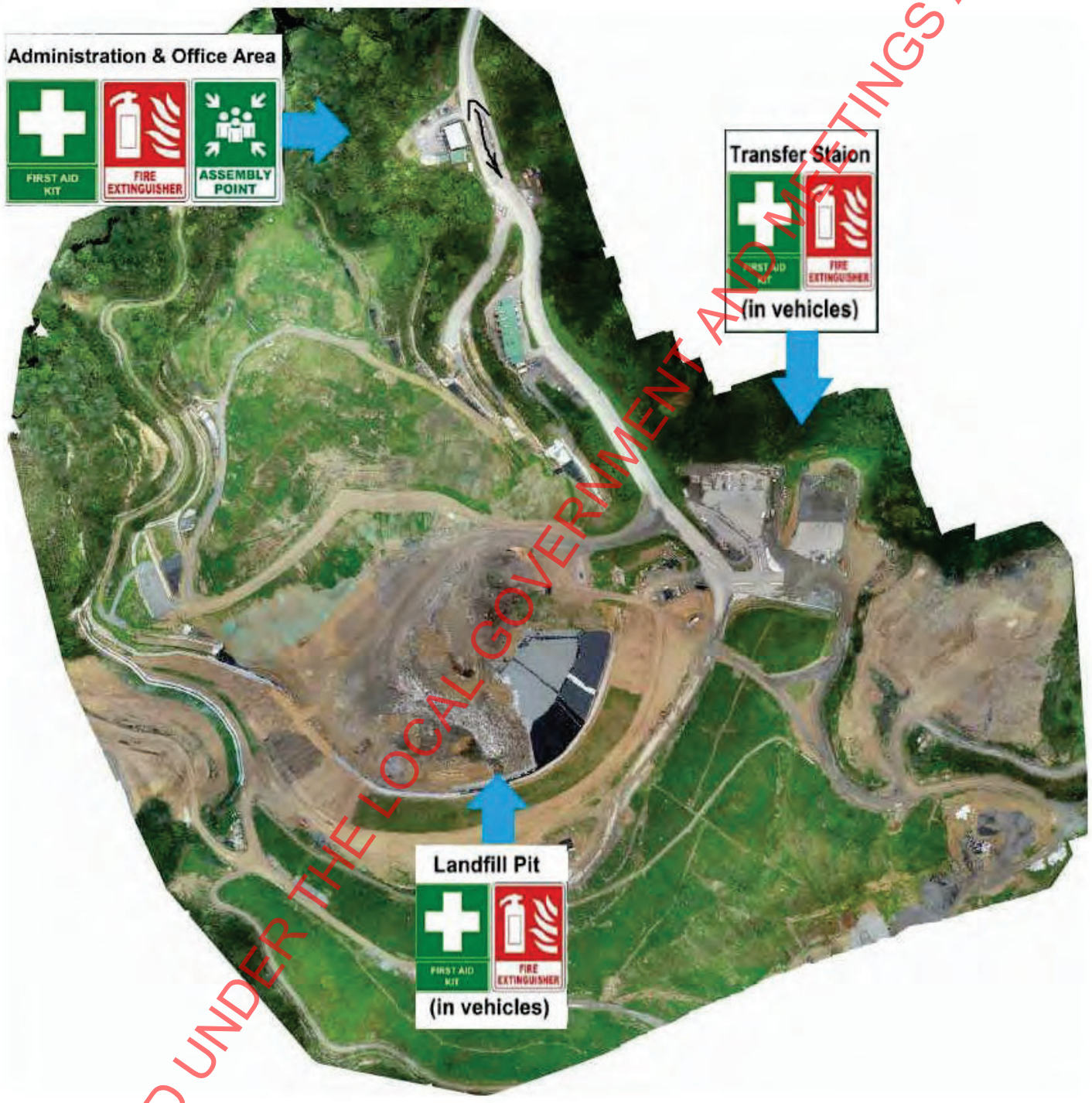
SITE EMERGENCY MANGEMENT PLAN

HSEQ Management System

Section 7: Evacuation Plan

The site evacuation plan details all buildings, plant, utilities mains, exit points, evacuation assembly area(s), first aid facilities, emergency alarm locations and fire extinguisher equipment location



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Our city

Appendix G

Taranaki District Council Supporting Letter

Taranaki Regional Council

20 April 2022
Document 3017717

Waste Management NZ Ltd
Private Bag 14919
Auckland 1741

Dear CEO/Consent Holder

21-75 Lower Waiwhakaiho Catchment Monitoring Programme Annual Report 2020-2021

At the latest meeting of the Consents and Regulatory Committee of the Taranaki Regional Council, on 15 March 2022, the annual compliance monitoring report for 2020-2021 (21-75 Lower Waiwhakaiho Catchment Monitoring Programme Annual Report 2020-2021) covering activities undertaken by Waste management NZ Ltd was received and considered.

Council has assessed the environmental and consent administrative performance of your organisation as 'high' and therefore this is an appropriate opportunity for me to commend you and your staff on attaining the level of performance that the Council has publicly recognised.

It is pleasing to see organisations such as yours demonstrate a level of environmental responsibility and custodianship that goes beyond mere compliance with consent requirements, and instead reflects accountability for attitudes and behaviour around environmental care. In a world of pressures such as economic performance, health and safety obligations, the juggling of staff resources, capability and availability, uncertain confidence in the business sector, and other demands, the Council wants to acknowledge the commitment and positive contribution your organisation has demonstrated to protecting and maintaining the state of the region's environment.

I wish to also encourage you to support your staff to maintain and to extend their environmental commitment in 2022-2023. Council officers are available to support and discuss environmental initiatives and practices at any time, most immediately during their compliance inspections and monitoring, but also throughout the year.

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Appendix H

Attachment H - Key Personnel Listing Form and Detailed CVs

Attachment H – Key Personnel Listing Form

TENDER FOR:	Silverstream Landfill Operations Contract

The Tenderer must complete the following table regarding key personnel (Including key roles pre-filled in the table below) who will be involved in the Contract Works.

Name of proposed Key Personnel	Description of Role/Position	Previous Experience (or refer to CV to be included)	Percentage of time Key Personnel will be involved in the Contract Works
s7(2)(a)	Contractor's Representative	Refer to CV attached	As required
	Contract Manager	Refer to CV attached	As required
	Landfill Manager	Refer to CV attached	100%
	Site Supervisor/ Foreman	Refer to CV attached	100%
	Quality Manager	Refer to CV attached	As required
	Health and Safety Supervisor	Refer to CV attached	As required
	Environmental Manager	Refer to CV attached	As required
	Sustainability and Innovation Manager	Refer to CV attached	As required
	Landfill Phase 2 and 3 Methodology and Decarbonisation Input	Refer to CV attached	Estimate 20% or as required
	Landfill Phase 2 and 3 Methodology Input	Refer to CV attached	Estimate 10% or as required

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s7(2)(a)

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Appendix I

Toitū Certificate

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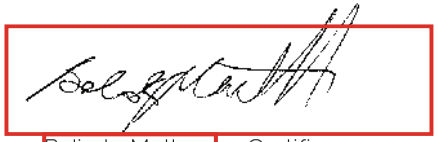
TOITŪ CARBON REDUCE

This is to certify that:

Waste Management New Zealand Limited

meets the requirements of Toitū carbonreduce certification having measured its greenhouse gas emissions in accordance with ISO 14064-1:2006 and committed to managing and reducing its emissions in respect of the operational activities of its organisation, including landfill gas emissions from partially owned landfills on an equity share basis.



Belinda Mathers — Certifier

TOITŪ ENVIROCARE

Date issued: 28 May 2020 | Valid until: 28 May 2023
Certificate Number: 2020045J | Certification Status: Certified organisation
Company Address: 86 Lunn Avenue, Mt Wellington Auckland 1072, New Zealand
Certification Year Level of Assurance: Limited

Please refer to the disclosure page on www.toitu.co.nz for further details.
Toitū carbonreduce is an annual certification programme and this certificate only remains valid with an annual surveillance audit.

JAS-ANZ

WWW.JAS-ANZ.ORG/REGISTER

Certifed by Enviro-Mark Solutions Limited (trading as Toitū Envirocare)

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Appendix J

Sustainable Procurement Policy and CAPEX Example

Sustainable Procurement Policy

1.0 Purpose

This Policy sets out the business rules and objectives for procuring goods and services used by Waste Management NZ Ltd ("WM"). This Policy applies to all divisions of the Company and is to ensure maximum sustainable economic efficiency through leverage of WM purchasing power, along with maintaining professional integrity, accountability and probity for all purchasing activity. It should be noted that the selection of the service provider or goods supplier is not based on just price, but other attributes will also be factored, such as strategic business plan, sustainability, values alignment, goods / service suitability, geographical coverage, risk assessment, service levels, health and safety practices and support functions.

The procurement process is end to end and covers the life-span of a goods or service, from the identification of need, through to the end of a service, or the end of useful life and subsequent disposal of a goods. Procurement starts with the internal alignment of the business requirements and a sound business case.

The objective of the procurement process is to arrange the procurement of goods and services which offer best value for the business, fit for purpose, timely, and sustainable. This requires that the procurement of goods or services be managed through a robust procurement and sourcing process framework.

2.0 Scope

This Policy applies to the procurement by WM of all goods and services whether by way of purchase, lease or otherwise.

Procurement does not necessarily own all purchasing however, advises the business through the planning process by either:

1. Reviewing the Business Case and advising business to follow the procurement guidelines
2. Reviewing the BC and advising submitter to gather further information or revise approach
3. Reviewing the BC and completing a market exercise (closed tender or full RFX process)

Refer to Procurement Process Flow Chart

This Policy does not apply to the engagement of specialist advisors and owner drivers.

3.0 Procurement Process Objectives

The objectives of the procurement process are to ensure:

a) fit for purpose procurement best practice (including continuous improvement)

b) delivery of best performance monitoring, supplier relationship management and KPIs that deliver value add

c) aligns with strategic objectives of WM as a group

d) balance the goal of achieving the lowest sustainable total cost of ownership possible while still achieving the most appropriate technical solution to meet the specified performance criteria;

e) procurement is effective and efficient, balancing the desire for choice and lower prices with the benefit of maintaining stable, trustworthy, and effective working relationships with providers.

f) that procurement decisions are made transparently where appropriate, and that suppliers are treated equally during a competitive sourcing process.

g) our operation remains environmentally, socially, and economically sustainable.

h) our procurement process has no negative impacts on our customers.

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4.0 Responsibilities

All procurement must be undertaken in accordance with the rules set out in the WM Business Rules and Delegated Authority Levels.("DOA") Any probity assurance needed will be undertaken by the Manager of Procurement, .

All procurement over $100,000 in value or in total spend per annum will need to involve the Manager of Procurements sign off and WM procurement process run except where otherwise agreed with the Manager of Procurement.

Where a particular business unit is the primary purchaser of goods or services in a particular category, the business unit will work with the Manager of Procurement to ensure the best outcome is achieved for the business. Other key stakeholders must be consulted in this process especially where it impacts other regions or divisions of the business. The extent of this consultation and stakeholder involvement will be decided by the relevant business manager together with the Manager of Procurement on a case-by-case basis.

Support for procurement activities, particularly formal sourcing processes and more complex contract processes will be provided by the Manager of Procurement and the legal department.

5.0 Preferred Suppliers

When procuring goods and services for WM, if the company already has a preferred supplier for those goods or services, it should be used. If a preferred supplier cannot, for genuine business reasons be used, the purchaser must obtain authorisation from the Manager of Procurement through the Procurement Assistance Request e-From ahead of any sourcing activity being undertaken, and in all cases, prior to the goods or services being ordered by the business.

The purchaser must fill out the New Supplier eform and to gain approval from the Manager of Procurement and Financial Services.

A list of Preferred Suppliers will be maintained by the Manager of Procurement and kept on the procurement page of the WM Procurement portal.

6.0 Supplier & Contractor Management

Once the procurement process has been completed and the supplier has been set up for purchasing, a person will be appointed as the Relationship Manager (for contractors: Contract Manager). This will either be the relevant EMT Member or the Manager of Procurement if it is a national supplier or it may be another person if that is more appropriate, such as when a supplier is only used by a specific area or branch of the business.

For contractors, the Contract Manager is responsible for completion of the following before a supplier commences work for WM:

a) The Contractor Pre-qualification Application; and

In addition, each individual branch that engages the supplier to work in their area will be responsible for completing the following;

b) Worker Site Induction Form; and

c) explaining Health and Safety Terms for Contractors.

7.0 Procurement Business Rules

a) Procurement valued at $100,000 or less per annum (excluding GST) that has no national implications will be made in accordance with section 4.2.1 and 4.2.2 of the DOA.

b) Procurement valued at $100,000 or less per annum (excluding GST), but which has national implications, such as affecting more than one site / branch, or which will result in a new preferred supplier, must be approved by the Manager of Procurement and be authorised in accordance with the DOA.

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c) Procurement valued at above $100,000 per annum (excluding GST) must be reviewed by the Manager of Procurement and be authorised in accordance with sections 4.2.1 and 4.2.2 of the DOA.

The terms and conditions of all sourcing processes and contracts at, or over the value of $25,000, must be reviewed by the Manager of Procurement and where not on standard WM documentation, must also be reviewed by the Manager of Procurement and legal department, prior to being entered into.
Note: Standard practice is to utilise WM terms & conditions to protect our business!

d) All expenditure over $100,000 per annum in aggregate must be entered into only after a competitive sourcing process has been conducted, with at least three suppliers and using WM Supplier Standard Terms – Short Form, unless otherwise agreed with the Manager of Procurement, Chief Financial Officer or Managing Director.

e) When a sourcing process is conducted, it must be completed in accordance with the RFP Template which outlines:

i. The principles of the RFP Sourcing Process;
ii. RFP Sourcing requirements;
iii. The process leading to supplier selection; and
iv. How the RFP Sourcing Process will be monitored
v. WM Standard Terms and Conditions

This provides both WM and all suppliers involved in the sourcing process, a fair and transparent understanding of the processes expected to be undertaken and the requirements of the parties involved.

Evaluation of responses in a sourcing process shall be made using weighted evaluation methodology pre-agreed with the Manager of Procurement.

8.0 Sustainability

Suppliers' sustainability strategy, policies, certifications, track record, and reporting capability must be included as requirements in all RFP Sourcing processes and will form part of WMNZ's weighted evaluation process.

Where WMNZ goods or service specifications are likely to affect the sustainability of our operations or the supplier's operations, such effect shall be considered in WMNZ's drafting of specification, requirements or business needs (as applicable) to respondents, and in the evaluation of respondents' proposed solution.

9.0 Method for Calculating Procurement Value

The basis for assessment of value should be "reasonable and honest", based on the best available knowledge known at the time. This should be calculated by the contract owner and the amount will be approved in accordance with the DOA.

Contract Value is based on the maximum estimated total value of the procurement over its entire expected duration, including both the initial term of the contract and any provisions for additional items, or time extensions which WM may be obliged to enter into.

This includes optional purchases, premiums, fees, commissions, interest and any other revenue streams that may be provided for in the contract. All forms of remuneration including payments to an agent or supply broker, must be declared in the contract.

10.0 Key Performance Indicators and reviews

Clear measurable KPIs must be set into the contract that can be reviewed annually to form part of the SRM (supplier relationship management).

Annual reviews and meetings must be undertaken for contracts valuing over $100,000 per annum 30 days prior to annual review date.

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Pricing reviews will only be undertaken by WM with 30 days' notice from suppliers with an attached business case. Any price change will only be accepted in mutual agreement in writing by both parties.

This Policy will be reviewed in accordance with the date in the footer.

s7(2)(a)

–

Approved by the Managing Director

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CAPITAL EXPENDITURE APPLICATION (CEA)

Title:
Division: UNI/LNI/SI/TS/Corporate
Branch:
Capital Amount: $XX,XXX

EXECUTIVE SUMMARY

Provide brief details of the asset are we proposing to purchase/build and how it will be utilised in the branch – include brief background on operations and how your business expects to perform the work.

The key drivers for <insert capital spend description> are:

- Delivers to the business XXX (ensure points are succinct, legitimate and accurate and they justify why capex is required).
- A summary of any key risks and assumptions if they are major.
- Purchasing lead time/contract time frames

If it is a growth asset include a sentence. If approved the business considers that an incremental uplift in earnings from XXX will be delivered due to XXX expand as appropriate.

SAFETY & RISK EVALUATION

If this is a HS&E/Compliance Capex

Provide details on any key safety information regarding the capital expenditure.

Should the capital application not be approved, the risk that <detail if we do not do this, what is the outcome, and any specific safety (licence fees etc.) considerations>.

SUSTAINABILITY EVALUATION (to be completed for all CEAs over $20k)

Our Environment:

Calculate the capex's carbon footprint over a 12 month period in kgCO2e.

Does the capex support your division's carbon footprint targets?

Is there an increase or decrease in WM's carbon footprint?

Guidance is given in the appendix

Sustainable Procurement:

Has supplier been reviewed against WM's Code of Conduct and Performance Management Framework?

Our Community:

Will the capex impact on our surrounding community?

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CAPITAL EXPENDITURE APPLICATION (CEA)

Guidance: either positive or negative change in noise, dust, education, social media etc.

Our Customers:

Will the capex impact on our customers?

Guidance: either positive or negative customer experience, digital solutions, new partnerships etc.

Our People:

Will the capex impact on our team members?

Guidance: either positive or negative Health & Safety, diversity & inclusion etc.

Our Business:

Will the capex impact on WM's support for a circular economy?

Guidance: either positive or negative impact on NZ's circular economy, waste minimisation in NZ, recycling facilities etc. If this is a HS&E/Compliance Capex

FINANCIAL SUMMARY

The financial model assumptions underpinning this proposal are:

- A marginal methodology has been used based on a <insert number of years excel model based on> year study period to calculate NPV and IRR.
- Depreciation is based on a XX year useful life.
- <Insert name of asset to be retired> (Asset <insert number>) has a WDV of $<insert WDV from latest FAR>, proceeds on disposal are estimated to be $0,000, resulting in a loss/gain of $0,000.
- Insert other Key Drivers of payback/funding (revenue/costs etc.), if applicable
- If growth asset – Revenue is ascertained by XXXX (refer to volumes). First year revenue is $???
- Utilisation levels of the equipment
- A 3 or 5 year extract from the financial model is shown below:

TECHNICAL EVALUATION

The following elements have been scoped out and evaluated in considering this proposal:

- Safety requirements.
- Specifications of the equipment. Remember to write this in layman's terms so anyone can understand them.
- Industry expectations and best practice
- Risks, restrictions, assumptions

The following quotes were sourced for this work:

- Name of Company $00,000

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CAPITAL EXPENDITURE APPLICATION (CEA)

- Name of Company $00,000

The supplier (<insert name of supplier>) was selected due to/as …

Should this proposal be approved, the Branch Manager will work with Procurement to ensure the contract is in accordance with….

COMMERCIAL AND STRATEGIC EVALUATION

Provide details on any key strategic information:

- Any business strategy relating to the capital spend. Eg, if the spend is key to entering a new marketplace, to increase our competitive presence in the marketplace, win a specific contract etc.
- Key risks and mitigation tactics.

The options explored in this proposal are summarised as:

- To do nothing; <insert succinct sentence on why this is not an option>.
- Alternative: <insert succinct sentence on other option explored before submitting this application and why this is not an option>
- **Name of Capex**; this is the preferred option and delivers to the business <complete sentence on what this capex will deliver to the business>.

Appendix

Carbon Footprint *calculation guidance*

Capex Impact	***Emission Factor***	***Example:***
Diesel in litres (including long haul hireage)	*2.690*	*Increase of 1000 litres of diesel per year:* ⇨ *2.69 x 1000 = 2,690 kgCO_2e*
Electricity in kWh	*0.098*	*Increase in 1000 kWh of electricity per year:* ⇨ *0.0977 x 1000 = 98 kgCO_2e*
LPG in kg's	*3.029*	*Increase in 1000 kg's of LPG per year:* ⇨ *3.029 x 1000 = 3,029 kgCO_2e*
Shipping freight overseas in tonnes per kilometre travelled	*0.020*	*Increase of 500 kg's shipped to Jakarta (10,717 km's) four times in a single year:* ⇨ *500 x 10,717 x 0.020 x 4 = 428,680 kgCO_2e*

For further emission factors and questions contact WM's sustainability manager.

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Appendix K

Silverstream Site Induction Sheet

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Waste Management

SILVERSTREAM LANDFILL

SITE INFORMATION

This Information Sheet provides Visitors, Service Personnel and Contractors with safety information while accessing, visiting and/or working at **Waste Management Silverstream Landfill**, situated at Reynolds Bach Drive, Silverstream, Upper Hutt.

It is a **Condition of Entry** that Visitors, Service Personnel and Contractors be inducted to the site and follow all safety policies, procedures, controls, notices, signage and instructions while at Silverstream Landfill. All policies and procedures are available from the Landfill Manager (s7(2)(a)) contactable on s7(2)(a)

Please read this information sheet in conjunction with any site induction and complete the Statement of Acceptance below to confirm your understanding and acceptance of the Conditions of Entry.

Statement of Acceptance

I acknowledge that I have read and understood the requirements for accessing, visiting and/or working at WM Silverstream Landfill.

- Name: _____
- Company: _____
- Signature: _____
- Date: _____

Sign In/Sign out Procedures

All Visitors, Service Personnel and Contractors must '**sign in'** the Visitor Control Register at the kiosk on arrival to site and '**sign out'** on leaving the site. No exceptions.

Significant Site Hazards/Risks and Controls

Hazard/Risk	Control
Explosion and/or fire following ignition of flammable gases (methane) constantly present on site.	No smoking, no naked flames, no source of ignition beyond the kiosk; Hot Works Permit required for exceptions to the above ; SEMP & Fire Extinguishers.
Heavy duty vehicles & mobile plant movements including reversing and high density traffic in restricted area (e.g. pit area).	Traffic Management Plan (TMP) including posted speed limits, 5 Metre Rule and Road Code; Spotter/Guide; Reversing technology; Licensed/trained drivers and operators.
Uneven surfaces and gradients causing slips, trips, falls.	PPE - safety boots with ankle support; Walk/Do not run policy; Do not walk on uncovered refuse.
Fall to depth at transfer station pits	Guardrails; Signage – no public in transfer pit area.
Exposure to Biological Waste	PPE – gloves & eye protection; Health monitoring programme; No scavenging policy.

General Site Rules

All Visitors, Service Personnel and Contractors must:

- Sign in/Sign out when arriving/leaving the landfill;
- Follow all safety policies, procedures; instructions, notices and signage at all times;
- Wear the appropriate PPE (as specified for the task);
- Stay within their designated work areas;
- Only operate plant & machinery if authorised to do so;
- Not smoke (incl vape and e-cig) or introduce any source of ignition (naked flame, welding arcs, etc) as flammable gases (methane) are present on site;
- Keep to the posted speed limits;
- Vehicles & mobile plant have 'right of way' in all areas on the landfill (ensure to make eye contact with the driver/operator when appreciating vehicles/mobile plant and follow the **5 Metre Rule**);
- Not engage in 'TOM FOOLERY' and/or acts that may endanger oneself or others;
- Report ALL incidents, injuries, illness and near misses, to the landfill manager however small or insignificant they may appear to be.

Personal Protective Equipment requirements

All visitors and Contractors must wear the appropriate safety clothing & gear (aka PPE) for the work they intend to undertake at the landfill. The **minimum PPE requirement for accessing the landfill,** irrespective of work being performed, is high visibility clothing (vest, overall), wrist to ankle cover and safety boots (steel or composite capped) and a Hard Hat when accessing the active tip face.

Reporting incidents, injuries, illness or near misses

All incidents, injuries, illness and near misses, must be reported to the Landfill Manager or the Company Representative assigned to you immediately via RT radio or in person. Should the Landfill Manager or the Co Rep not be immediately available, reports must be made to any Landfill Staff member including the kiosk operator.

In case of emergency

Should an emergency occur *(for example fire, vehicle accident, personal injury)* **immediately raise the alarm**, **clear the immediate area**, alert the Landfill Manager, Co Rep or Landfill Staff and await instructions.

When advised to evacuate the landfill site:

- Follow the instructions of the fire wardens;
- Shut down processes and/or machinery *(if it is safe to do so)*;
- Exit the area immediately by the nearest safe exit, walk DO NOT RUN *(illustrated by purple arrows on the map on the reverse)*;
- Assist persons requiring assistance;
- Report to the Assembly Point (**Landfill Admin Area Car Park**);
- Remain at the Assembly Point until the "all clear' is given.

If you need to contact emergency services, dial 111 from the landline telephone in the office or kiosk. Note that mobile phone coverage on site is generally poor.

First aid kits and fire extinguishers are available on site *(see map on the reverse).*

Site lay-out *(see map on the reverse)*

Enquiries *(Office, Kiosk or Landfill Manager)* 04 563 6952

Emergencies *(Police, Ambulance, Fire)* Dial 11

Site Lay-out (Including Emergency Evacuation Plan)

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Appendix L

Silverstream Traffic Management Plan

TRAFFIC MANAGEMENT PLAN
HSEQ Management System

SILVERSTREAM
LANDFILL

WM LNI SIL PL 1006 REV 3

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Revision Status

Date	Issue	By	CHECKED	Approved
08/05/2012	0	s7(2)(a)		
04/09/2015	1			s7(2)(a)
27/04/2018	2			
01/04/2019	3			
16/12/2020	4			
11/5/2021	5			

TRAFFIC MANAGEMENT PLAN
HSEQ Management System

This Traffic Management Plan has been developed from the risk assessment. This plan aims to outline the designated traffic rules on the site and to provide a safe system for employees, visitors and contractors. The plan provides for the orderly movement of vehicles, pedestrians, loading and unloading of goods, and parking.

This plan considers the risks associated with the identified hazards including, but not limited to:

- Requirement to segregate pedestrians from vehicles;
- Workplace layout;
- Traffic volumes, including routes, priority and exclusion zones;
- Signage;
- Lighting and visibility;
- Speed limits; and,
- Parking.

The Branch Manager, Supervisor, and employees review this traffic management plan on a regular basis as the needs and issues of the site change and develop. Any changes are subjected to further risk assessments. The traffic management plan is reviewed as a minimum on an annual basis.

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TRAFFIC MANAGEMENT

1.1 Site Access

The site is located at: **Reynolds Bach Drive, Silverstream, Upper Hutt**

Traffic entrance to the site is via: **Reynolds Bach Drive, Silverstream, Upper Hutt**

Traffic exit from the site is via: **Reynolds Bach Drive, Silverstream, Upper Hutt**

Parking is provided for employees, visitors and contractors and is situated at:
Car park is in front of the office complex. (Turn right directly before the Weighbridge)

1.2 Speed Limit

Like any other public road, speed restrictions shall apply to all vehicles using the roadways and parking facilities at the site.

The speed restrictions applying to the site are:

- **30km/h** for vehicle traffic areas unless otherwise specified (e.g. roadways);
- **Walking pace** in loading/unloading areas;
- **Walking pace** in pedestrian designated areas; and,
- **Walking pace** in vehicle parking areas.

1.3 Vehicle Rules

The following rules shall apply regarding the 'right of way' at this site:

Designated Area	Right of Way
Roadways	Vehicles
Road intersections	Vehicle on the right
Transfer Station	Pedestrians
Parking areas	Pedestrians

1.4 Demarcation Zones

Specific zones delineating vehicle operational areas and pedestrian areas have been clearly defined and designated.

1.5 Parking

Parking is provided in the designated location and parking outside this area is not permissible unless specific approval from the Branch Manager has been obtained.

Contractors required to have their vehicle near the contracted works shall be advised by their Company representative of the location.

Vehicles waiting unloading or loading shall be directed to a safe area by a landfill employee.

1.6 Pedestrian Interaction

Pedestrian interaction within the site has been minimized through the use of a number of traffic control measures, including, but not limited to:

- Public pedestrians not permitted in areas where heavy machinery/mobile plant is operating;
- Children to stay inside vehicles (no exceptions);
- High visibility clothing; and,
- Vehicle speed limits.

At times, pedestrians and vehicles will be required to work in the same general area. Where this is necessary, the interaction shall be managed by means of a safe process, including, but not limited to:

- Mobile plant and pedestrian demarcation zones.

All personnel working in and entering operational areas of the site are required to wear high visibility clothing or hi-visibility vest.

Visitors shall be provided with a hi-visibility vest prior to entering operational areas by their Company representative. Such vests shall be returned when leaving the site.

1.7 Signage

Appropriate traffic control signage is displayed throughout the site. These signs serve as a constant reminder to all vehicle operators and pedestrians of conditions and requirements when accessing various areas on the site.

All signage requirements are reviewed and audited annually and checked during workplace inspections.

1.8 Lighting and Visibility

Lighting has been specifically designed to ensure that vehicle and pedestrian operations are visible at all times.

Vehicles on site use their lights at all times whilst operating and where fitted, flashing orbital lights and reversing alarms are operated.

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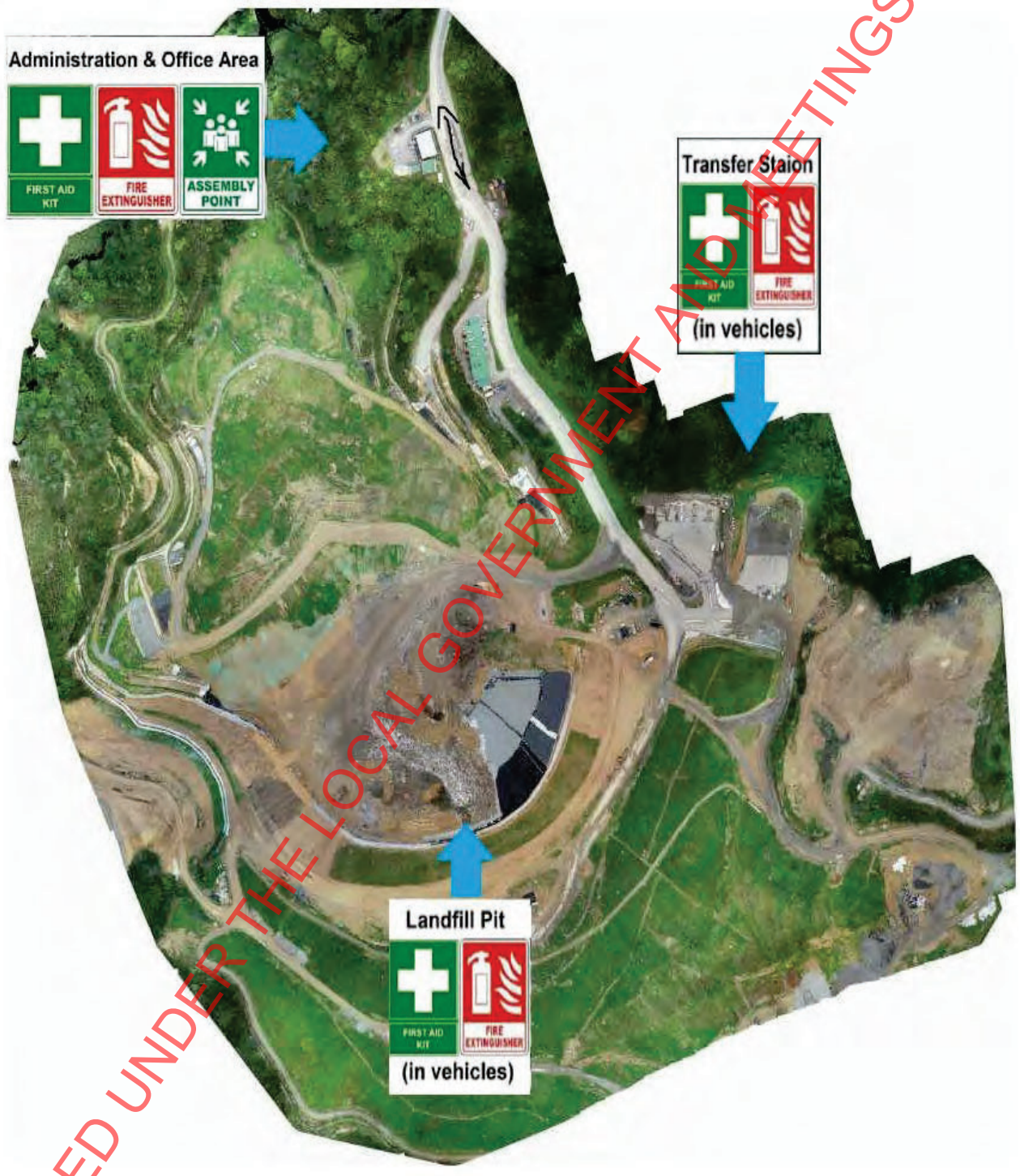
1.9 Site Plan



1.10

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Appendix M

Attachment D - Statement of Departures

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Attachment D – Statement of Departures Form

Note: This form must accompany each Tender submitted. See also clause 106 of the Conditions of Tendering.

TENDER FOR:	**Silverstream Landfill Operations Contract**

We acknowledge the Conditions of Tendering, clause 106 and hereby declare that our tender submission is based on the Tender Documents, and the following clarifications, tags and assumptions.

Please provide an electronic copy (Word document in 'Landscape format') with your tender response.

No.	Clause/ref	Tender clarification/contractual tag	Principal's response	Contractor's response	Agreed position
General					
1.		NZS3917		WMNZ will take an agile approach, working in partnership with Council to satisfactorily complete the contract negotiation process. Negotiations will be aimed at ensuring that the Contract are fair, balanced as to risk and foster collaboration between the parties and a sustainable commercial relationship. • WMNZ is familiar with the Proposed **NZS3917:2013** Contracts and we have used these successfully with Hutt City Council. • We confirm that based on the Price and Non-Price assumptions and exceptions listed in this tender, the Proposed Contracts terms and conditions are generally acceptable. We agree to negotiate a Contract based on the Proposed Contract, or such amended terms and conditions of contract as are agreed with the Council following negotiations.	

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No.	Clause/ref	Tender clarification/contractual tag	Principal's response	Contractor's response	Agreed position
				• If we are successful in progressing to the next stage, we would like to discuss and clarify with you where the Proposed Contract maybe inconsistent with any of our Price or Non-Price assumptions. • At the contract negotiation phase, we ask to revisit and discuss the regime around liability caps, exclusions and indemnities depending on the final agreed service, product and performance measures accepted by Council following considering the overall operation of the Contract to ensure a fair and balanced outcome.	
Conditions of Contract					
3.					
Technical clarifications					
6.					

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Name of Tenderer:	Waste Management NZ Limited
Signed by authorised signatory of the Tenderer:	s7(2)(a) [redacted]
Name and title of authorised signatory:	s7(2)(a) [redacted] General Manager – Lower North Island
Date:	3 June 2022

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Appendix N

Attachment E - Tenderer's Business Details

Attachment E – Tenderer's Business Details (including References and Banker's Details)

NAME OF BUSINESS: WASTE MANAGEMENT NZ LIMITED

GST REGISTRATION NUMBER: 094-152-232

PHYSICAL ADDRESS OF BUSINESS: Head Office: 318 East Tamaki Road, East Tamaki, Auckland

POSTAL ADDRESS OF BUSINESS: Private Bag 14919, Panmure, Auckland

TELEPHONE NO: s7(2)(a) FAX NO:

NAME AND ADDRESS OF DIRECTORS / MEMBERS / PARTNERS / PROPRIETORS

FULL NAMES	ADDRESSES	TEL NO
s7(2)(a)	s7(2)(a)	
s7(2)(a)		
s7(2)(a)		

TRADE REFERENCES (PLEASE SUPPLY THREE) – In supplying the trade references the Tenderer authorises the Principal to contact the references regarding the Tenderers ability to undertake the Contract.

FULL NAMES	ADDRESSES	TEL NO
s7(2)(a) Waste Disposal Services	s7(2)(a)	Mobile: s7(2)(a)
s7(2)(a) Dunedin City Council Landfill Engineer	s7(2)(a)	Mobile: s7(2)(a)
s7(2)(a) Waimakariri District Couuncil	s7(2)(a)	Mobile: s7(2)(a)

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BANKER'S DETAILS:

The Tenderer's banker may be contacted by the Principal regarding the Tenderer's ability to undertake the Contract.

NAME	CONTACT DETAILS
ANZ	L25 ANZ Centre, 23-29 Albert Street, Auckland 1010

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Appendix O

Attachment I - Insurance Information Form

Attachment I – Insurance Information Form

TENDER FOR:	**Silverstream Landfill Operations Contract**

The Tenderer must provide details of its insurance policies as listed below.

1. In addition, the Tenderer should provide a letter or certificate from the insurer(s) confirming that the Tenderer and insurer are prepared to enter into the insurances described below should the Tenderer's Tender be accepted.

Type of Cover	Sum Insured	Deductible	Expiry Date	Name of Insurer	Policy No.
Mobile Plant	s7(2)(b)(ii)		s7(2)(j)		
Public liability					
Motor vehicle					

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Confirmation of cover

PO Box 497
Shortland Street
Auckland 1140

Tel 099288053

This is to certify the currency and coverage of the below mentioned insurances and to confirm they will remain in force during the period of insurance stated below, unless cancelled in accordance with the relevant cancellation conditions.

Date:	Monday, 28 June 2021
Client:	Waste Management NZ Limited MP
Reference No:	1064998
Insurer:	Zurich New Zealand
Period of Insurance:	From 4:00pm Thursday, 1 July 2021 to 4:00pm Friday, 1 July 2022
Situation:	Anywhere in New Zealand
Conditions:	This policy is issued subject standard market conditions and exceptions.
Basis of settlement:	Market value
Third Party Liability:	s7(2)(b)(ii)
Vehicle(s) insured:	The policy covers all vehicles owned and operated by the insured, including the schedule of vehicles declared by the client.

Signed

Zurich New Zealand

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Certificate of Currency

To Whom It May Concern

This certificate hereby certifies that cover has been granted subject to the exceptions, terms and conditions and definitions of the Policy (as amended from time to time, including after the date of this Certificate of Currency).

Details of Insurance

Issuing Office:	New Zealand	
Insured:	Waste Management NZ Limited	
Class:	Public & Products Liability	
Policy Period:	From:	01 July 2021 at 4.00pm
	To:	01 July 2022 at 4.00pm
Policy Territory:	Worldwide	
Policy Number:	NZCASA01485	
Limit of Liability:	s7(2)(b)(ii) [redacted] any one Occurrence and in the aggregate in respect of the Products Hazard.	

Please refer to your agent, broker or the relevant Chubb office for further information or a copy of the Policy.

Chubb Insurance New Zealand Limited has an "AA-" insurer financial strength rating given by S&P Global Ratings.

Signed at Auckland on behalf of Chubb Insurance New Zealand Limited:

s7(2)(a) [redacted]

Authorised Representative
Chubb Insurance New Zealand Limited

28 June 2021
Date of Issue

RELEASED UNDER THE LOCAL GOVERNMENT AND MEETINGS ACT 1987

Confirmation of cover

PO Box 497
Shortland Street
Auckland 1140

Tel 099288053

This is to certify the currency and coverage of the below mentioned insurances and to confirm they will remain in force during the period of insurance stated below, unless cancelled in accordance with the relevant cancellation conditions.

Date:	Monday, 28 June 2021
Client:	Waste Management NZ Limited
Reference No:	1057569
Insurer:	Zurich New Zealand
Period of Insurance:	From 4:00pm Thursday, 1 July 2021 to 4:00pm Friday, 1 July 2022
Situation:	Anywhere in New Zealand
Conditions:	This policy is issued subject standard market conditions and exceptions.
Basis of settlement:	Market value
Third Party Liability:	s7(2)(b)(ii)
Vehicle(s) insured:	The policy covers all vehicles owned and operated by the insured, including the schedule of vehicles declared by the client.

Signed

Zurich New Zealand

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Certificate of Currency

To Whom It May Concern

This certificate hereby certifies that cover has been granted subject to the exceptions, terms and conditions and definitions of the Policy (as amended from time to time, including after the date of this Certificate of Currency).

Details of Insurance

Issuing Office:	New Zealand
Insured:	Waste Management NZ Limited and subsidiaries
Class:	Professional Indemnity
Policy Period:	From: 01 July 2021 at 4.00pm To: 01 July 2022 at 4.00pm
Policy Territory:	Worldwide exluding USA/Canada
Policy Number:	NZCPIA01477
Limit of Liability:	s7(2)(b)(ii) [redacted]
Business Description:	1) Consulting and advice with respect to recycling and waste minimisation 2) Bespoke heavy vehicle certification services 3) Management consulting and engineering consulting relating to landfills 4) Project management relating to landfills

Please refer to your agent, broker or the relevant Chubb office for further information or a copy of the Policy.

Chubb Insurance New Zealand Limited has an "AA-" insurer financial strength rating given by Standard & Poor's (Australia) Pty Limited.

Signed at Auckland on behalf of Chubb Insurance New Zealand Limited:

s7(2)(a) [redacted]

Authorised Representative
Chubb Insurance New Zealand Limited

01/07/2021
Date of Issue

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Appendix P

Attachment J - Conflict of Interest Form

Attachment J – Conflict of Interest Declaration Form

TENDER FOR:		**Silverstream Landfill Operations Contract**
TENDER FOR:	**Silverstream Landfill Operations Contract**	

CONFLICT OF INTEREST DEFINITION:

A conflict of interest is a situation in which a Tenderer could gain (or be seen to gain) an unfair advantage through an association with an individual or organisation. Associations include financial, personal, professional, family-related or community-related relationships.

- An actual conflict of interest is where there already is a conflict.
- A potential conflict of interest is where the conflict is about to happen or could happen.
- A perceived conflict of interest is where other people might reasonably think there is a conflict.

QUESTIONNAIRE:

Note: each organisation involved in a joint tender must submit a *separate* questionnaire and declaration.

	QUESTION	**RESPONSE** (Select one answer for each question. Select "potentially" if others could perceive that a conflict exists.)
1.	Does any person in your organisation have a close friend or relative who is (or could be) involved in any evaluation or decision-making relating to this procurement process?	No
2.	Has any person in your organisation recently offered any special discounts, gifts, trips, hospitality, rewards or favours to any person involved in any evaluation or decision-making relating to this procurement process? *(e.g. free travel, free samples for personal use)*	No
3.	Does any person involved in any evaluation or decision-making relating to this procurement process have a financial interest in your organisation? *(e.g. the person*	No

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	is an employee of, or a shareholder in, your organisation)	
4.	Are you aware of anything that might give the appearance that any person involved in the evaluation stage or decision-making stage of this procurement process is biased towards or against your organisation? *(e.g. the person has used your organization's corporate box)*	No
5.	Is there anything else that we should know?	No

If you answered "**Yes**" or "**Potentially**" to any of the questions above, please set out the details of the situation below.

Declaration: I declare for and on behalf of the Tenderer that the information provided in this document is true, complete and accurate to the best of my knowledge and on behalf of the Tenderer identified below, and agree to notify Hutt City Council as soon as possible of any conflicts of interest that arise (or could arise) in the future.

Name of Tenderer:	Waste Management NZ Limited
Signed by authorised signatory of the Tenderer:	s7(2)(a) [redacted]
Name and title of authorised signatory:	s7(2)(a) [redacted] General Manager – Lower North Island
Date:	

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Appendix Q

Bank Form for Payment of Bond

Form of Bond

AGREEMENT FOR (**Agreement**)

AGREEMENT REFERENCE:

THIS DEED is made on the day of

BY Waste Management NZ Limited (**the Supplier**)

of 318 East Tamaki Road, East Tamaki, Auckland 2013

AND ANZ Bank NZ Limited (**the Surety**)

of Auckland

IT IS MADE IN THE FOLLOWING CIRCUMSTANCES:

A The Supplier has entered into the Agreement with **Hutt City Council**. The Supplier has agreed to carry out and fulfil the obligations imposed on the Supplier by the Agreement.

B The Agreement requires the Supplier to provide the Council with security in the form of a bond to ensure performance of the Supplier's obligations under the Agreement.

BY THIS DEED

1 **THE** Supplier and Surety are jointly and severally held and bound to the Council in the sum of NZ$ 500,000 and bind themselves, their successors and assigns jointly and severally for the payment of that sum.

2 **THE** Surety irrevocably and unconditionally undertakes, as primary obligator, to pay to the Council any sum or sums which may, from time to time, be demanded in writing by the Council up to an amount not exceeding in aggregate the amount of the Bond Sum. The Surety shall make payment forthwith upon demand by the Council without enquiry as to, and without having regard to, the position as between the Supplier and the Council, or whether or not the Supplier is in default under the agreement. Payment will be made without reference to and notwithstanding any instructions from the Supplier to the contrary.

3 **THE** Surety shall not be released from any liability under this bond:

(a) By an alteration in the terms of the agreement between the Council and the Supplier;

(b) By any alteration in the extent or nature of the Services to be completed, delivered and having defects remedied;

(c) By any allowance of time by the Council; or

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(d) By any forbearance or waiver by the Council in respect of any of the Supplier's obligations or in respect of any default on the part of the Supplier.

4 **THE** undertaking at clause 1 is a continuing undertaking and shall remain in force and effect until the earliest of the following having occurred:

(a) Receipt by the Surety of written notification signed for and on behalf of the Council that the undertaking is no longer required by the Council, which notification may be given at any time by the Council;

(b) The return of this bond to the Surety by the Council in accordance with the terms of the Agreement; and

(c) Payment by the Surety to the Council of the Bond Sum under clause 5.

5 **REGARDLESS** of anything else within this document the Surety may at any time (without being required to) pay to the Council the Bond Sum less any amounts it may have previously paid under this bond or a lesser amount as may be required and specified by the Council. Any such payment shall be deemed to have been made at the demand or request of the Council and when paid, the liability of the Surety shall be at an end.

6 **ANY** demand for payment of any moneys which may become payable pursuant to the provisions of this bond shall be deemed to have been sufficiently made if made in writing signed by the Council or by any director, secretary, employee or officer of the Council, and if served personally on, or posted as a registered letter addressed to the Surety at its registered office or its principal place of business in New Zealand, or any other address notified to the Council by the Surety including the address stated above. Such demand for payment, if sent by registered post, shall be deemed to be received by the Surety on the third day following the day it was handed over into the care of an office of the New Zealand postal system.

7 The bond shall be governed by New Zealand law.

EXECUTED AND DELIVERED AS A DEED

Signed on behalf of **ANZ BANK NZ LIMITED** by its duly authorised attorney:

_____

Signature of attorney

_____

Name of attorney

In the presence of:

_____

Signature of witness

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Full name of witness

Occupation

City/town of residence

[Insert certificate of non-revocation of power of attorney as required.]

EXECUTED AND DELIVERED AS A DEED

Signed on behalf of **WASTE MANAGEMENT NZ LIMITED**

Signature of Director

Name of Director

Signature of Director

Name of Director

Note: - This bond must be executed by the Supplier and by the Surety in the manner required for execution of a deed. Any of these parties which is a company or body corporate must execute by affixing its seal, which may be attested in the manner provided in its articles association or other constitution. Alternatively, a company may execute the bond by having it signed, under the name of the company, by having it signed under the name of the company, by two or more directors. If there is only one director, the signature must be witnessed. The witness must not only sign but must also add his or her occupation and address. In the case of a party who is an individual, the party must sign and the signature must be witnessed by another person. The witness must not only sign but must also add his or her occupation and address.

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For more information please contact:

s7(2)(a)
General Manager - Lower North Island
s7(2)(a)@wastemanagement.co.nz

s7(2)(a)
www.wastemanagement.co.nz

Schedule 26 - Post-tender documents and Notices to Tenders

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s7(2)(a)

Subject: Silverstream Landfill - Contract Documents for review

From: s7(2)(a)@tonkintaylor.co.nz>
Sent: Friday, January 27, 2023 10:03 AM
To: s7(2)(a)
Cc: jorn.scherzer@huttcity.govt.nz; s7(2)(a)@tonkintaylor.co.nz>; s7(2)(a)
s7(2)(a)@wastemanagement.co.nz>
Subject: RE: Silverstream Landfill - Contract Documents for review

Good morning s7(2)(a)

We've just had a meeting with HCC and WMNZ this morning and can confirm the following:

- Transition Services – Cl 5.1A can be deleted as no Transition Services are required. The incumbent Contractor will remain on site and the Management Plans will address items in the Specification.
- Date of Commencement – All parties agreed to make the Date of Commencement '2 Calendar Months after the Date of Acceptance of Tender'. Cl 10.1 of Schedule 1 to be updated.
- T+T will update Clauses 1.7.1 and 5.1 of the Specification to align with the 2 Calendar Month period.

When do you think you'll be able to return your review comments to us and we'll finalise the document?

Regards,

s7(2)(a)
| Senior Civil Engineer
MEng, CPEng, CMEngNZ
Tonkin + Taylor - *Exceptional thinking together*
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s7(2)(a)

From: s7(2)(a)@wastemanagement.co.nz>
Sent: Thursday, 19 January 2023 1:45 pm
To: s7(2)(a)
Cc: jorn.scherzer@huttcity.govt.nz; Peter Cameron; Hugh Cherrill; s7(2)(a) s7(2)(a)
Subject: Re: [EXTERNAL EMAIL] RE: Amended Items for Silverstream Landfill Operations Contract

Thanks s7(2)(a)

All good our end.

s7(2)(a)

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From: s7(2)(a)@tonkintaylor.co.nz>
Sent: Thursday, 19 January 2023, 12:07 pm
To: s7(2)(a)@wastemanagement.co.nz>
Cc: jorn.scherzer@huttcity.govt.nz <jorn.scherzer@huttcity.govt.nz>; Peter Cameron <Peter.Cameron@huttcity.govt.nz>; s7(2)(a)@tonkintaylor.co.nz>; s7(2)(a) s7(2)(a)@tonkintaylor.co.nz>; s7(2)(a)@tonkintaylor.co.nz>; s7(2)(a) s7(2)(a)@tonkintaylor.co.nz>; s7(2)(a)@wastemanagement.co.nz>
Subject: RE: [EXTERNAL EMAIL] RE: Amended Items for Silverstream Landfill Operations Contract

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Thanks s7(2)(a)

Sorry to hear you are in hospital – hopefully not to serious.

The LMP stuff is just an update to the LMP (2 Clauses only) to align it with the contract spec and so avoid a discrepancy. It is virtually identical to the version issued at tender. The two amended Clauses are below FYI.

Regards,

s7(2)(a)

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4.10 Compaction

4.10.1 Method

Refuse shall be compacted in the Landfill to target a minimum in-situ refuse density of ~~850kg~~ 1000kg per cubic metre.~~,~~ This density includes (but not limited to) daily cover, capping, roading material, and settlement. The density is exclusive of final cover material.

The number of passes by a machine over the waste to achieve optimum compaction depends on a number of factors, including the type of machine, its ground pressure, the type of waste and the slope. The more passes made over the waste the better, but operational considerations mean that the number of passes should be in the range of three to five.

Refuse shall be compacted in layers typically of ~~1000~~ 600 mm loose depth. Where possible the layers shall be sloped away from the sides and final surfaces of the Landfill. Placement of further layers of refuse shall not commence until waste already placed has been adequately compacted.

Bulky refuse items require special measures in their placement. Where possible, such items will be crushed by some mechanical means to reduce void space prior to placement at the base of the working face. These items are not to be placed in the final lift of refuse (they should be placed more than 1 metre deep in the refuse), since settlement of the refuse may result in such items piercing the cap.

4.10.2 Density testing

~~All Landfill waste is composed of two separately measured streams. All commercial~~ refuse is weighed at the weighbridge.

~~Waste disposed of at the transfer station is domestic waste delivered by cars, utes, vans, and trailers. The average weights of these vehicles are calculated at the landfill weighbridge quarterly by weighing 100 of each type of vehicle. These average weights are used during each month, and are updated quarterly. The average weight is then multiplied by the number of vehicles logged in Landfill 3000 at the Kiosk to track the volumes of waste disposed of at the transfer station each month.~~

~~From the 1st of July 2022 the paragraph above will no longer be relevant, as the landfill will move to weigh based charging for all users.~~

From time to time the working area is physically surveyed, thus enabling the general compaction rate to be determined. During the interval between surveys, density targets can be checked using weighbridge data and estimated void utilisation.

From: s7(2)(a) @wastemanagement.co.nz>
Sent: Thursday, 19 January 2023 11:57 am
To: s7(2)(a) @tonkintaylor.co.nz>
Cc: jorn.scherzer@huttcity.govt.nz; Peter Cameron <Peter.Cameron@huttcity.govt.nz>; Hugh Cherrill <HCherrill@tonkintaylor.co.nz>; s7(2)(a) @tonkintaylor.co.nz>; s7(2)(a) s7(2)(a) @tonkintaylor.co.nz>; s7(2)(a) @tonkintaylor.co.nz>; s7(2)(a)

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s7(2)(a)@wastemanagement.co.nz>
Subject: Re: [EXTERNAL EMAIL] RE: Amended Items for Silverstream Landfill Operations Contract

Hi s7(2)(a)

Happy with everything below but we need to check detail with regards to LMP and revert back.

I'm actually in the hospital today, Unexpected.

Will come back as soon as I can clarify LMP changes.

Regards
s7(2)(a)

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From: s7(2)(a)@tonkintaylor.co.nz>
Sent: Thursday, 19 January 2023, 11:39 am
To: s7(2)(a)@wastemanagement.co.nz>
Cc: jorn.scherzer@huttcity.govt.nz <jorn.scherzer@huttcity.govt.nz>; Peter Cameron <Peter.Cameron@huttcity.govt.nz>; Hugh Cherrill <HCherrill@tonkintaylor.co.nz>; s7(2)(a) s7(2)(a)@tonkintaylor.co.nz>; s7(2)(a)@tonkintaylor.co.nz>; s7(2)(a) s7(2)(a)@tonkintaylor.co.nz>; s7(2)(a)@wastemanagement.co.nz>
Subject: [EXTERNAL EMAIL] RE: Amended Items for Silverstream Landfill Operations Contract

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Morning s7(2)(a)

I've completed the documents in draft based on the notes below and the Contract Documents are going through final internal review.

Would it be possible if you could please come back to me today on the below? Ideally we would issue to council end of this week to keep momentum and the approval process moving.

Happy to talk through any of this.

Nearly there.

Regards,

s7(2)(a)

From: s7(2)(a)
Sent: Wednesday, 18 January 2023 12:53 pm
To: s7(2)(a)@wastemanagement.co.nz>
Cc: jorn.scherzer@huttcity.govt.nz; Peter Cameron <Peter.Cameron@huttcity.govt.nz>; s7(2)(a) s7(2)(a)@tonkintaylor.co.nz>; s7(2)(a)@tonkintaylor.co.nz>; s7(2)(a) s7(2)(a)@tonkintaylor.co.nz>; s7(2)(a)@tonkintaylor.co.nz>; s7(2)(a)@wastemanagement.co.nz)' s7(2)(a)@wastemanagement.co.nz>

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Please let me know you are happy with the above.

Regards,

s7(2)(a)

s7(2)(a) | **Senior Civil Engineer**
MEng, CPEng, CMEngNZ
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NOTICE TO TENDERER

NTT-001

NTT Subject:	Extension to Tender Period	Date:	27/04/2022
Contract Name:	Silverstream Landfill Operations Contract	Contract Number:	AD22-2102
Tenderer:	All Tenderers	Job No:	82948.1000
Attn:	All Tenderers		
Copy to:	Jörn Scherzer, Diljinder Uppal		

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NOTICE TO TENDERER

NTT-002

NTT Subject:	Tenderers Site Visit	Date:	27/04/2022
Contract Name:	Silverstream Landfill Operations Contract	Contract Number:	AD22-2102
Tenderer:	All Tenderers	Job No:	82948.1000
Attn:	All Tenderers		
Copy to:	Jörn Scherzer, Diljinder Uppal		

All Tenderers have been contacted regarding a date for a site visit. This notice outlines the perquisites, rules of engagement and outline agenda for the visit.

Prerequisites

- The site has a wrist to ankle cover policy, please bring your own PPE including a high visibility jacket, a hard hat and lace up boots;
- The site is operating under the orange traffic light setting. As part of our COVID-19 measures we request all Tenderers to wear a face covering during the visit and that all Tenderers use their own vehicles when driving around site;
- All Tenderers are to make there own way to site and meet at the administration building car park on Reynolds Bach Drive. AWD/4WD vehicles are required as we will be driving to different parts of the site.
- Please find attached a site information H&S form for visitors. This outlines the minimum site entry requirements and main site hazards for visitors. Please read, sign the Statement of Acceptance and return to me prior to your site visit. We will briefly discuss this on the day.

Rule of Engagement

During the site visit, there will be a number of queries from the Tenderer, which will be categorised as General and Tenderer specific queries. These types of queries will be dealt with differently in terms what discussions/questions/answers that will be provided back to all tenderers and those which will be kept confidential. General and Tenderer specific queries are defined as:

- *General:* Queries relating to the tender documents, requirements, specification etc will be noted and responded to via NTT to all tenderers.
- *Tenderer specific:* Queries relating to a particular tenderer's proposals to meet the requirements of the tender e.g. proposals for carbon reduction, specific methodology, approach, resourcing etc. will be responded to verbally at the site visit, will not be shared with other tenderers and treated as confidential.

This will allow for open discussions with each Tenderer while allowing clarification of any general information to be communicated to all tenderers to ensure all have the same information on which to tender.

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Waste Management

SILVERSTREAM LANDFILL

SITE INFORMATION

This Information Sheet provides Visitors, Service Personnel and Contractors with safety information while accessing, visiting and/or working at **Waste Management Silverstream Landfill**, situated at Reynolds Bach Drive, Silverstream, Upper Hutt.

It is a **Condition of Entry** that Visitors, Service Personnel and Contractors be inducted to the site and follow all safety policies, procedures, controls, notices, signage and instructions while at Silverstream Landfill. All policies and procedures are available from the Landfill Manager (s7(2)(a)) contactable on s7(2)(a)

Please read this information sheet in conjunction with any site induction and complete the Statement of Acceptance below to confirm your understanding and acceptance of the Conditions of Entry.

Statement of Acceptance

I acknowledge that I have read and understood the requirements for accessing, visiting and/or working at WM Silverstream Landfill.

- Name: _____
- Company: _____
- Signature: _____
- Date: _____

Sign In/Sign out Procedures

All Visitors, Service Personnel and Contractors must '**sign in'** the Visitor Control Register at the kiosk on arrival to site and '**sign out'** on leaving the site. No exceptions.

Significant Site Hazards/Risks and Controls

Hazard/Risk	Control
Explosion and/or fire following ignition of flammable gases (methane) constantly present on site.	No smoking, no naked flames, no source of ignition beyond the kiosk; Hot Works Permit required for exceptions to the above ; SEMP & Fire Extinguishers.
Heavy duty vehicles & mobile plant movements including reversing and high density traffic in restricted area (e.g. pit area).	Traffic Management Plan (TMP) including posted speed limits, 5 Metre Rule and Road Code; Spotter/Guide; Reversing technology; Licensed/trained drivers and operators.
Uneven surfaces and gradients causing slips, trips, falls.	PPE - safety boots with ankle support; Walk/Do not run policy; Do not walk on uncovered refuse.
Fall to depth at transfer station pits	Guardrails; Signage – no public in transfer pit area.
Exposure to Biological Waste	PPE – gloves & eye protection; Health monitoring programme; No scavenging policy.

General Site Rules

All Visitors, Service Personnel and Contractors must:

- Sign in/Sign out when arriving/leaving the landfill;
- Follow all safety policies, procedures; instructions, notices and signage at all times;
- Wear the appropriate PPE (as specified for the task);
- Stay within their designated work areas;
- Only operate plant & machinery if authorised to do so;
- Not smoke (incl vape and e-cig) or introduce any source of ignition (naked flame, welding arcs, etc) as flammable gases (methane) are present on site;
- Keep to the posted speed limits;
- Vehicles & mobile plant have 'right of way' in all areas on the landfill (ensure to make eye contact with the driver/operator when appreciating vehicles/mobile plant and follow the **5 Metre Rule**);
- Not engage in 'TOM FOOLERY' and/or acts that may endanger oneself or others;
- Report ALL incidents, injuries, illness and near misses, to the landfill manager however small or insignificant they may appear to be.

Personal Protective Equipment requirements

All visitors and Contractors must wear the appropriate safety clothing & gear (aka PPE) for the work they intend to undertake at the landfill. The **minimum PPE requirement for accessing the landfill,** irrespective of work being performed, is high visibility clothing (vest, overall), safety boots (steel or composite capped) and a hi-vis hat (not personal cap or cowboy type hat).

Reporting incidents, injuries, illness or near misses

All incidents, injuries, illness and near misses, must be reported to the Landfill Manager or the Company Representative assigned to you immediately via RT radio or in person. Should the Landfill Manager or the Co Rep not be immediately available, reports must be made to any Landfill Staff member including the kiosk operator.

In case of emergency

Should an emergency occur *(for example fire, vehicle accident, personal injury)* **immediately raise the alarm**, **clear the immediate area**, alert the Landfill Manager, Co Rep or Landfill Staff and await instructions.

When advised to evacuate the landfill site:

- Follow the instructions of the fire wardens;
- Shut down processes and/or machinery *(if it is safe to do so)*;
- Exit the area immediately by the nearest safe exit, walk DO NOT RUN *(illustrated by purple arrows on the map on the reverse)*;
- Assist persons requiring assistance;
- Report to the Assembly Point (**Landfill Admin Area Car Park**);
- Remain at the Assembly Point until the "all clear' is given.

If you need to contact emergency services, dial 111 from the landline telephone in the office or kiosk. Note that mobile phone coverage on site is generally poor.

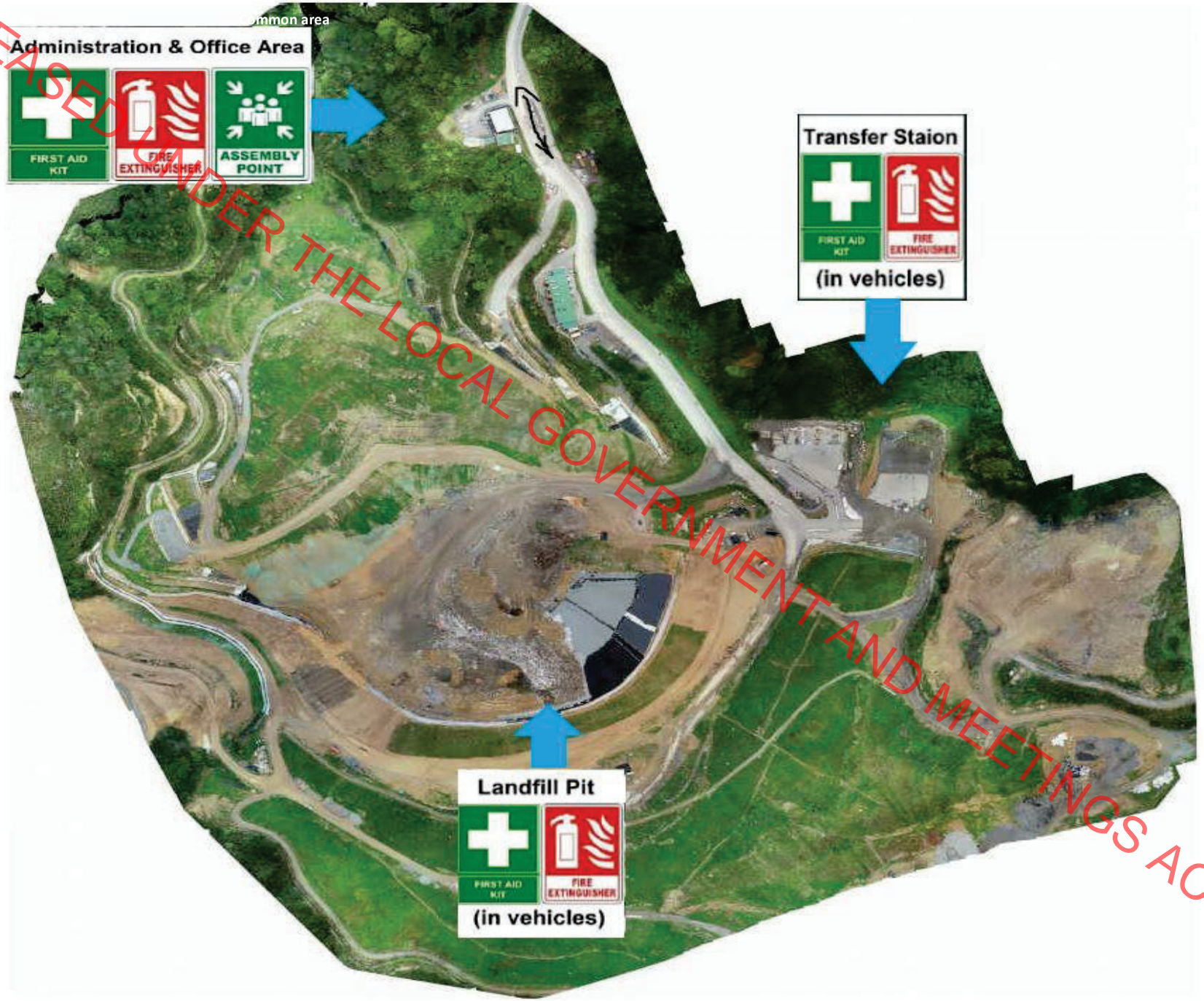
First aid kits and fire extinguishers are available on site *(see map on the reverse).*

Site lay-out *(see map on the reverse)*

Enquiries *(Office, Kiosk or Landfill Manager)* 04 563 6952

Emergencies *(Police, Ambulance, Fire)* Dial 11

Site Lay-out (Including Emergency Evacuation Plan)



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NOTICE TO TENDERER

NTT-003

NTT Subject:	Various Questions & Answers	Date:	02/05/2022
Contract Name:	Silverstream Landfill Operations Contract	Contract Number:	AD22-2102
Tenderer:	All Tenderers	Job No:	82948.1000
Attn:	All Tenderers		
Copy to:	Jörn Scherzer, Diljinder Uppal		

We have received several queries relating to this tender. The questions below are shown in *italics* with responses shown in normal text:

1. *Could we please be provided the Safety in Design review that has been undertaken by Tonkin and Taylor (or other design engineer), for all aspects of the load and downhill transport of waste to the base of the Stage 3 development, and with the subsequent evaluation and approval by Hutt City Council (as PCBU) for this development and operation methodology.*

We note the design process to determine appropriate routes for transportation of waste to the phase 3 cell has started, which, as noted in the Tender Documents has been developed to approximately a 30% level design for purpose of Tender. The design was limited to a 30% design to provide some certainty of access and leave flexibility in design development to allow future design input from the successful Tenderer. The 30% design is not the final design and the detailed design process is still to be completed. Safety in Design has been and will continue to be a key design consideration.

It is Council's expectation that the specific methodology for loading of waste and transport of waste from the phase 3 transfer pad to the phase 3 tip pad is developed by the Contractor. This can be discussed further at the Tenderers site visits.

Further to your request, we attach the following documentation for your reference:

- 180621 - Preliminary Review: Phase 3 Access Options
- 260122 – Addendum to Phase 3 Access Options Memo

2. *Would Hutt City Council allow the successful tenderer to have the opportunity to provide input into the Safety in Design Review and Landfill Design?*

Yes. It is expected that under the new contract, the successful Tenderer is welcome and encouraged to input into the design process to work towards the best outcome for the landfill, Council, users and operator. This is in line with the Head of Agreement document, which sets out the guiding principles and nature of the relationship with the successful Tenderer.

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Memo

To:	**Jörn Scherzer**	**Job No:**	**82948.210**
From:	s7(2)(a) **/ Southern Turner**	**Date:**	**18 June 2021**
cc:	s7(2)(a)		
Subject:	**Preliminary Review: Phase 3 Access Options**		

1 Background

Silverstream Landfill is currently operating in Stage 2 Phase 2 of the whole of life design (seen in Appendix C) and the fill operation is currently in Slope 8/9 of Phase 2. Phase 2 will continue with the filling of Slope 10 and Slope 11 which will bring the waste close to the consent height. It is estimated that the filling of Slope 11 will be completed by 2027, which will mark the completion of the Phase 2 operation. As part of the planned landfill development, the filling operation will then need to move to Phase 3 at the base of the valley. This shift to Phase 3 presents some significant challenges with regards to access and landfill operation, principally due to physical constraints in obtaining safe access to the base of a highly incised, steep valley. A safe and functional access road will need to be constructed to provide access suitable for commercial vehicles and operational machinery.

Further to our 20/21 letter of engagement, this memo presents an initial look at viable options to provide access to Phase 3. The review has been limited to a high-level options assessment, considering geometrics (i.e. what can physically be achieved within physical constraints), safety and indicative costs only.

This work is critical to the continued operation of the landfill. The Phase 3 access road will influence the methodology and associated cost of operating the landfill during the Phase 3 operation, which is expected to be quite different to phase 2. As you are aware, the operations contract is due to be tendered in early 2022 and it is highly likely, depending on contract term, that the filling of Phase 3 will form part of the new operations contract.

The purpose of this memo is to present our initial work to Council and agree upon a preferred option for further development in 21/22. It is our intent to develop the Phase 3 access to a 30% design in 21/22 to a stage suitable for inclusion in the new operations contract so there is sufficient information for Contractors to adequately price the Phase 3 operation.

2 Access Options

Providing suitable access to Phase 3 is not straightforward due to its location at the base of the valley. The only current existing access to Phase 3 is from the north via a long narrow single laned track, which is only suitable for small 4WD vehicles. To the south Phase 3 is bordered by the relatively steep front face of Phase 2 which currently has an access track only suitable for 4WD vehicles.

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- **Option 1:** Access Phase 3 from the south via the phase 2 front face, creating a two laned road, with safety edge earthen bunds. With this option, heavy commercial customer vehicles would drive the full length of the new access from gully W1/W2 down to a tip pad at the start of the Phase 3 waste filling area. This option can be seen on drawing 82948.2100 SK 10 Option 1 in Appendix B.
- **Option 2:** Access Phase 3 from the south via the phase 2 front face utilising a wide single lane with safety edge bunds and passing bays. The key difference between this option and Option 1 is that commercial vehicles would tip waste on a new tip pad in gully W1/W2, avoiding the need for heavy commercial customers to traverse a steep front face access road. In this option, the waste would need to be double handled as part of the landfill operation and transported to Phase 3 using capable heavy articulated dump trucks (ADT). This option can be seen on drawing 82948.2100 SK 10 Option 2 in Appendix B.
- **Option 3:** Access Phase 3 from base of the valley from the north. This option would require upgrading the existing narrow singled laned access track to create a two laned road fit for commercial vehicles. In addition, this option would likely require the relocation of the kiosk, weighbridges and a new commercial access from Reynold Bach Drive. This option can be seen on 82948.2100-SK 11_Aerial of access roads and 82948.2100-SK 12_Resource Consent Drawing Phase 3 in Appendix B.

We note that options 1 and 2 would both utilise the new Phase 2 roundabout, planned for construction in 21/22. Option 3 will require a new commercial access at the bottom of Reynolds Bach Drive.

3 Options Assessment

Although all three options are viable, each option has a different set of constraints, advantages, and disadvantages, which will impact the road construction, capital expenditure, and the long-term operation filling and management of the landfill. The constraints, advantages, disadvantages, and indicative order of magnitude costs for each option have been assessed in Appendix A: Phase 3 Landfill Access Options Assessment Table.

3.1 Safety in design workshop

A safety in design workshop was undertaken on the indicative designs to help assess the options. Some key points raised during this workshop, which will need further analysis during the concept level design stage are as follows:

Option	Safety in Design Issue
Option 1	Due to the steepness of the Phase 2 front face a vertical grade of 12% is required to reach a platform near the base of the valley. 12% is the upper limit of what a commercial vehicle could traverse. There is a risk of brake failure and run-away vehicles at this grade.
	Commercial vehicles may lose traction or get stuck on a 12% grade with an unsealed road (road is likely to be unsealed due to settlement).
	Where the access road crosses the waste mass, the road will experience settlement, compounding the vertical grade over time. If the road is built at the maximum grade that commercial vehicles can handle then the settlement of the road will make it unsafe for commercial vehicle to use.

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Option	Safety in Design Issue
Option 1 and 2	The access road applies a significant asymmetrical load to the Stage 2 waste mass and the landfill will need to be checked for stability. Known high leachate levels may exacerbate this issue.
	The 12% maximum grade will need to be maintained across the full width of the road. Vehicles travelling on the inside radii of turns experience higher grades so these turns will dictate the grade in these sections.
	The potential for brake failure and a runaway vehicle (commercial or ADT) will exist for the southern access road and a runout ramp or truck arrester bed should be investigated. A suitable place for a runout could be in the gulley below the administration offices.
	The radius immediately above the Phase 3 tipping pad (Ch 320m Option 1 and 220m Option 2) is quite tight and could be dangerous for either vehicle rollover or runaway vehicles. These radii should be made as large as possible to minimise this risk.
Option 3	This option may require relocation of the kiosk and weighbridge much further down Reynolds Bach Drive. This may cause queues to occur onto Hutt Road.
	Retaining the existing kiosk and weighbridge location would result in vehicles needing to travel all the way up Reynold Bach drive to be weighed and down again for landfill access. This is a very long trip for customers, who would then need to drive up the valley again to access Phase 3.
	An intersection improvement would be required at the interface of the new access road and Reynolds Bach Drive

4 Recommendation

We recommend that Council proceed with Option 2 as a preferred option. This option provides the best value to council in terms of likely capital expenditure and removes the risk of commercial customers traversing a very steep access road. Option 2 will utilise ADTs/Moxys (or alternative suitable vehicle proposed by the Contractor) to transfer waste from gully W1/W2 to Phase 3 and so eliminate the risk of runaway commercial customer vehicles present in Option 1. ADT's are designed to traverse steep difficult terrain, however brake failure is still possible and the ADTs would need to be well maintained for this operation. We expect that new ADTs can be purchased by the landfill operator as part of the new operations contract because the contract term should provide certainty to the Contractor to invest in new plant.

Option 3 is not recommended due to very high capital costs, significant risk with widening the existing valley over its entire length (slope stability etc) and the need to relocate the existing kiosk and weighbridge.

Subject to Council's approval, we propose to develop Option 2 to a 30% level design in the 21/22 financial year so that the Phase 3 access design can be included in the new operations contract tender documents. The 30% design will consider geotechnical, stormwater and further geometric refinements. This will allow the Contractor to price the Phase 3 works, which will be quite a different operation to that currently in Phase 2.

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Appendix A Phase 3 Landfill Access Options Assessment Table

Access Option	Constraints	Advantages	Disadvantages	Construction Cost Estimate (Order of magnitude)
Option 1 Two-lane Road for commercial vehicles from the south	The steeply incised valley and steep front face of Stage 2 and subsequent level difference from the currently landfill access point to the base of of valley. The proposed road is built on waste and will experience differential settlement resulting in the road surface needing to be an unbound granular layer. The differential settlement of this road will increase the roads grade. So, the road will need to be designed with a shallower grade to begin with. The proposed road has steep side slopes (1V:1.5H) to reduce the volume of fill required. This will require geotechnical design to ensure the road is stable as the waste settles. The proposed road requires a large road width to accommodate two lanes of commercial traffic.	Commercial vehicles can access the bottom of Phase 3 and once waste fills the first ~10 m will be able to drive directly to the waste filling area reducing the ongoing operational costs by removing the need to double handle waste. The large earthwork cut volumes will result in additional airspace being created for waste filling operations in future. Having two lanes to the bottom of Phase 3 ensures there is no traffic congestion caused by the access road. Utilises existing roundabout access (due for construction 21/22) Kiosks and weighbridge can remain in their current location.	Steep terrain necessitates a 12% steep road. The access road surface must be granular to cope with the differential settlement, steep vertical grades and high stress from commercial vehicles. Maintaining a 12% road suitable for commercial vehicles will require continued maintenance to keep the running surface suitable. The granular running surface is likely to increase the potential of commercial vehicles losing traction and becoming stuck. The steep nature of this road increases the potential for brake failure of vehicles. Presenting a real health and safety risk. The landfill operator has no control over the condition of commercial vehicles using the steep access road. The potential for a runaway truck using this	

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			road is higher than with commercial vehicles using it. The large road width will require additional fill over the single lane in Option 2	
Option 2 One-lane Road for Construction vehicles from the south	Significant overlap of the constraints exists between Options 1 and 2 these are: • The steep landfill face and incised valley • The granular road surface • Differential settlement of the waste • The steep side slopes of the road fill Additionally, Option 2 has some specific Constraints: Will require the creation of a separate waste tipping and transfer area and double handling of waste. The single lane must be wide enough to accommodate ADT's and include passing lanes.	The commercial vehicles (customers) will have no difficulty using the landfill. I.e not having to traverse 12% grade on unsealed road. There will be complete separation of the public from the waste filling operation. A 12% grade is manageable for articulated dump trucks (ADT's). Less road maintenance will be required compared to Option 1 as ADT's can drive on more undulating surfaces. Less cut to fill material is required compared to Option 1 so will have a reduced earthworks cost comparatively. Utilises existing roundabout access (due for construction 21/22) Kiosks and weighbridge can remain in their current location.	Steep terrain necessitates a 12% steep road. Maintaining a 12% road suitable for ADT's will require periodic maintenance to keep the running surface suitable. This option requires a significant increase in operational activities with both a tipping area and a waste filling area. This is required to double handle the waste resulting in higher operational costs over Option 1. If the waste is uncovered in ADT as it is transported to Phase 3 it will result in a larger spread of windblown litter compared to the sealed commercial trucks. The single lane with two passing bays may constrict the traffic flow to Phase 3 limiting the qty of waste accepted. This option will require traffic modelling to ensure road is suitable for future waste volumes.	

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Option 3 Two-lane Road for commercial vehicles from the north	The current road is single laned and will need two laned access for commercial vehicles. The road will require a second lane to be cut into the hill side. The current grade of the road is too steep in places to accommodate commercial vehicles. This will require earthworks to reduce the roads grade. Currently the dam utilises the existing road as its emergency spillway. This will require the dam's emergency spillway to be redesigned. The existing weigh bridge is at the top of Reynolds Bach Dr and the northern access to Phase 3 is at the bottom of Reynolds Bach Dr. This will either require moving weigh bridge for commercial vehicles to the bottom of the main road or for vehicles to drive to and from existing weigh bridge location to be weighed. A portion of the northern access track land was sold by HCC to Silverstream Retreat. Upgrading this track and constructing a commercial road will likely require negotiations with the landowner. The road runs directly past Silverstream Retreat's eastern boundary. The increase in vehicle traffic along this boundary will impact on Silverstream Retreat and will likely require the construction of a screen / fence for Silverstream Retreat.	The northern access will initially result in shorter dive lengths for commercial vehicles if the weigh station is moved to the bottom. Option 3 is a significantly flatter road compared to Options 1 & 2. There is less chance of vehicles becoming stuck or having brake failure.	This option will also result in waste being filled uphill, the opposite of how waste operators prefer to fill. This option will result in ongoing additional operational costs due to uphill filling. This option will require a significant intersection upgrade off Reynolds Bach Dr. If the weigh bridge is moved to the bottom of Reynolds Bach Dr there is a high potential for vehicles queues to spill onto Hutt Rd. This road will require significant earthworks and slope stability works to create dual lanes. This road does not utilise existing landfill services such as the soon to be constructed roundabout.	

Appendix B Drawings

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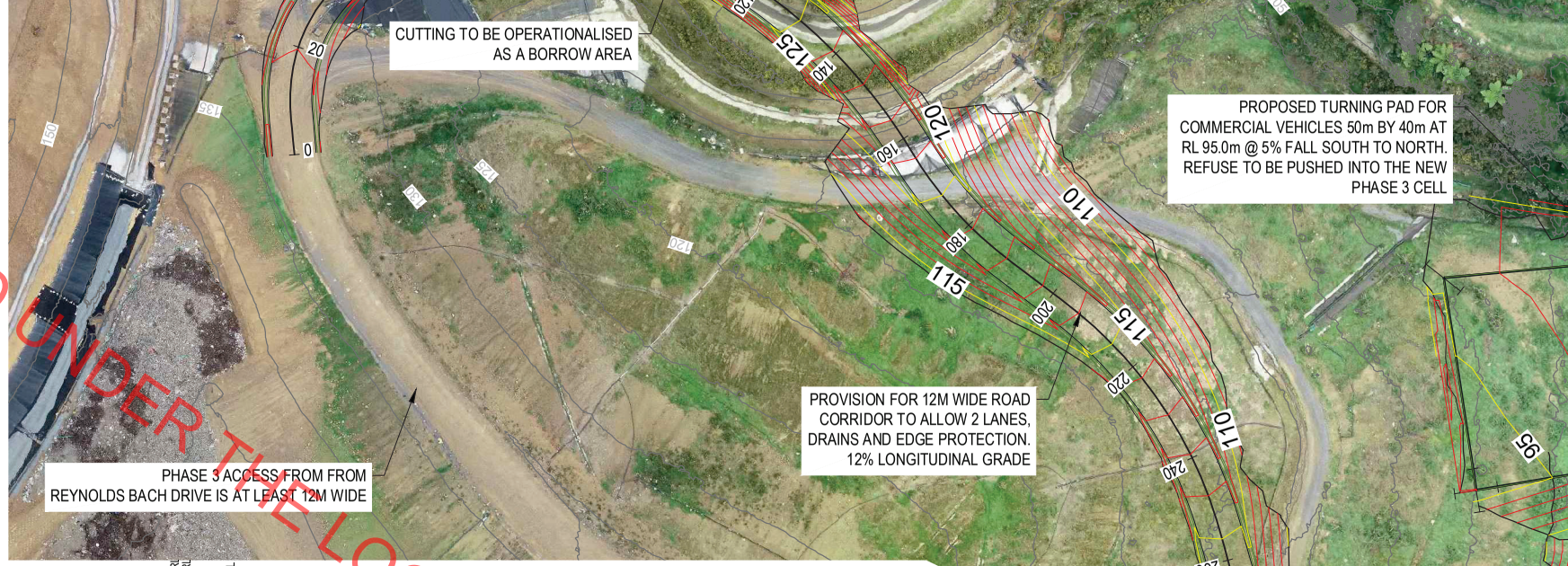

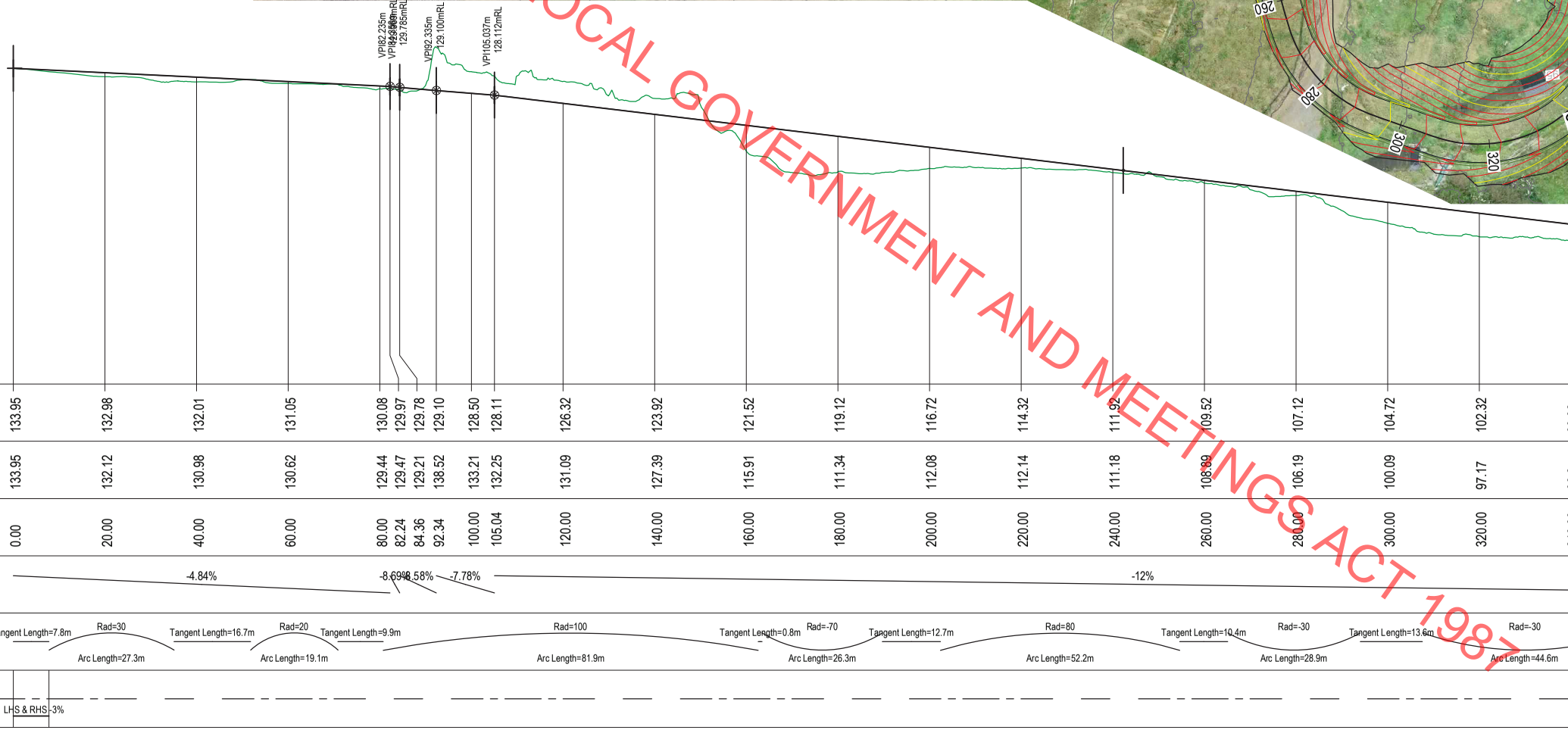

LONGITUDINAL SECTION: ALIGNMENT 1 >OPTION 1

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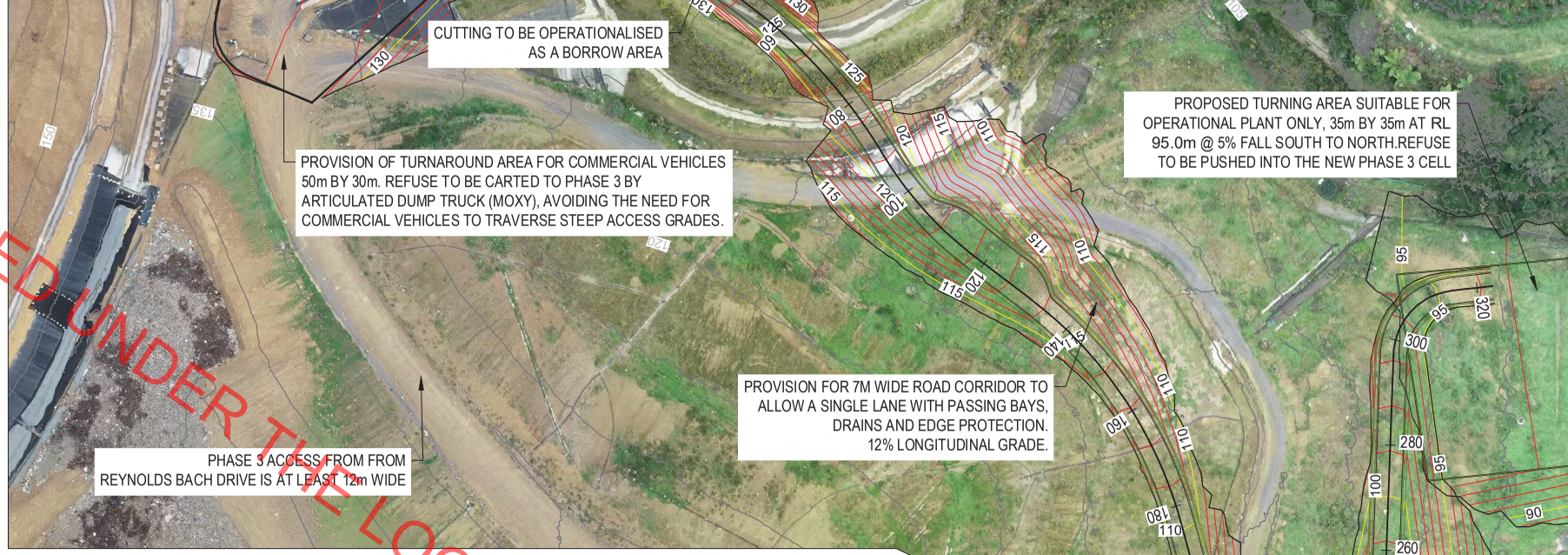

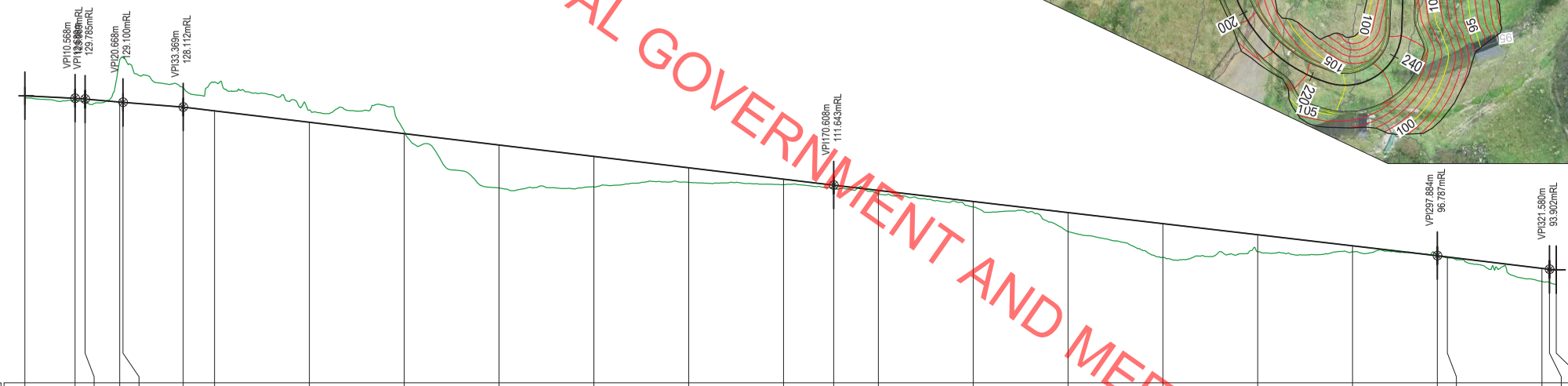

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RL (m)	130.17	129.47	129.21	137.97	138.52	132.25	133.37	127.48	122.96	111.05	111.29	112.26	111.75	110.96	109.77	107.06	101.86	96.44	97.67	97.57	96.79	96.34	91.34	91.2
	0.00	10.57	12.69	20.00	20.67	33.37	40.00	60.00	80.00	100.00	120.00	140.00	160.00	170.61	180.00	200.00	220.00	240.00	260.00	280.00	297.88	300.00	320.00	321.58
RY	-4.84%	8.69%	8.58%	-7.78%		-12%										-11.67%						-12.17%		-5.04%						
IETRY	Tangent Length=9.1m	Rad=100	Arc Length=81.9m	Tangent Length=0.8m	Rad=-70	Arc Length=26.3m	Tangent Length=12.7m	Rad=80	Arc Length=52.2m	Tangent Length=10.4m	Rad=-30	Arc Length=28.9m	Tangent Length=0.9m	Rad=-12	Arc Length=22.4m	Tangent Length=51.7m						Rad=12.5	Arc Length=17.7m	Tangent Length=7.5							

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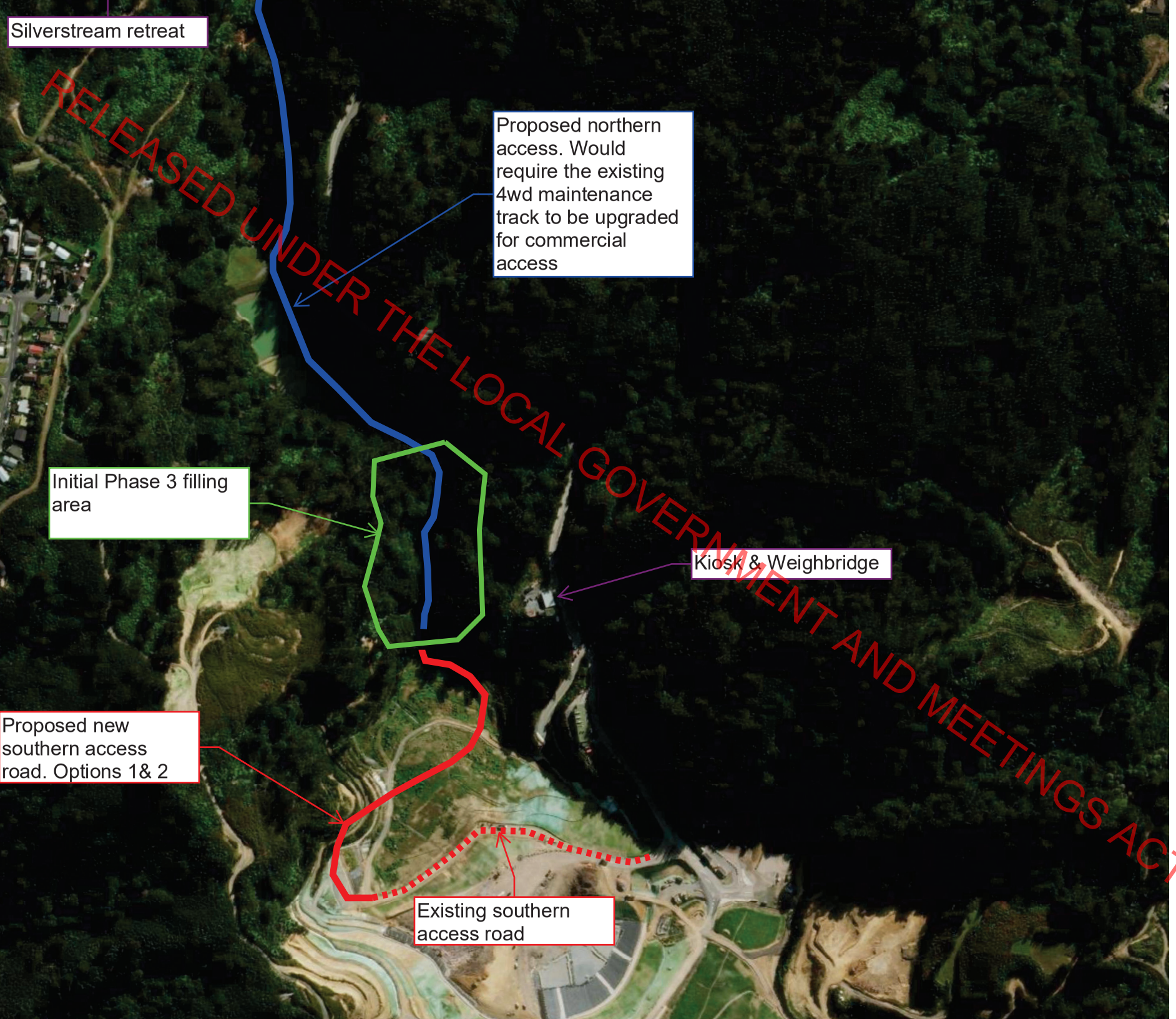

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A3 SCALE: 1:5,000

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1. World Imagery Sou
CNES/Airbus DS, USDA
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Created By:	STur
Approved By:	

TT Proj Ref:
82848.210

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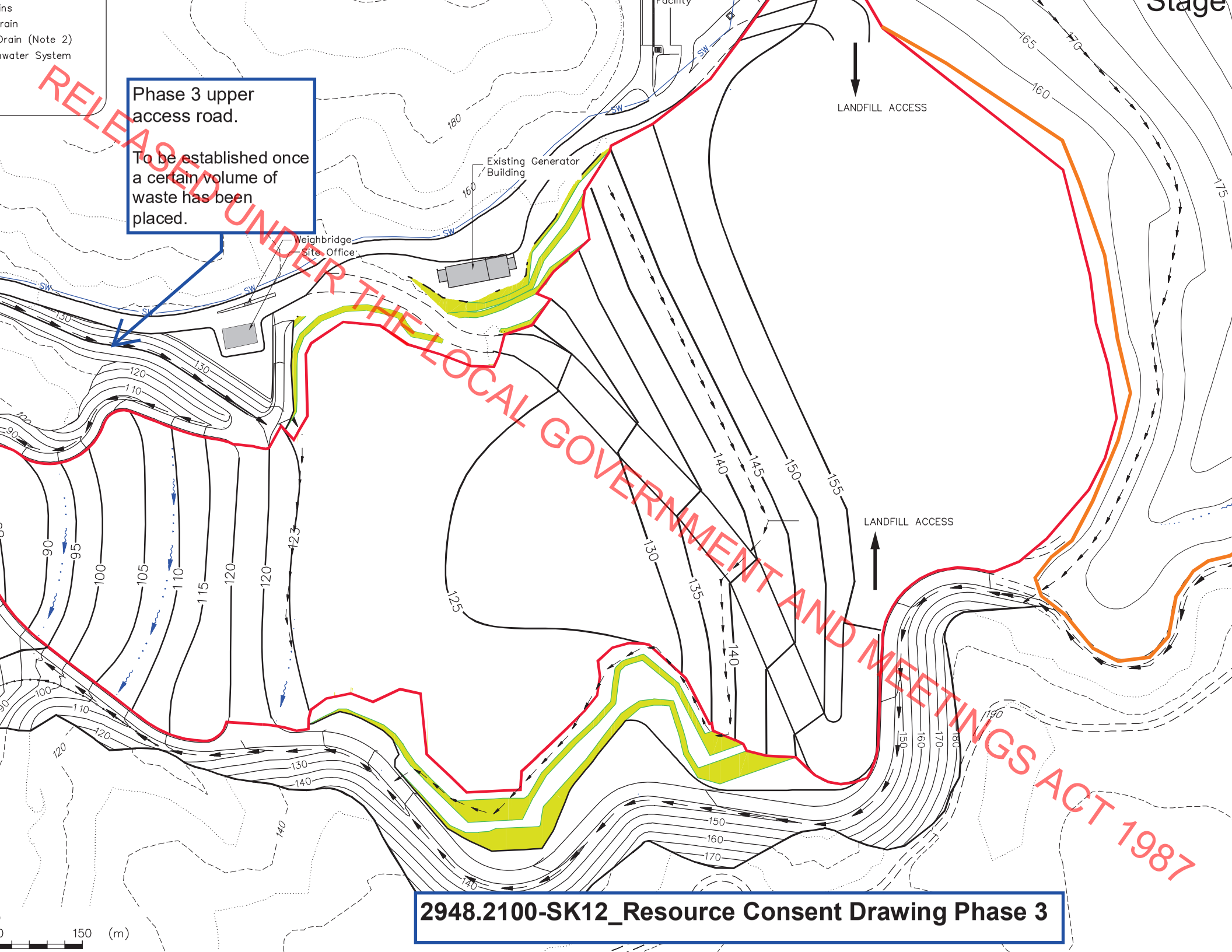

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2948.2100-SK12_Resource Consent Drawing Phase 3

Appendix C Stage 2 Development Phases

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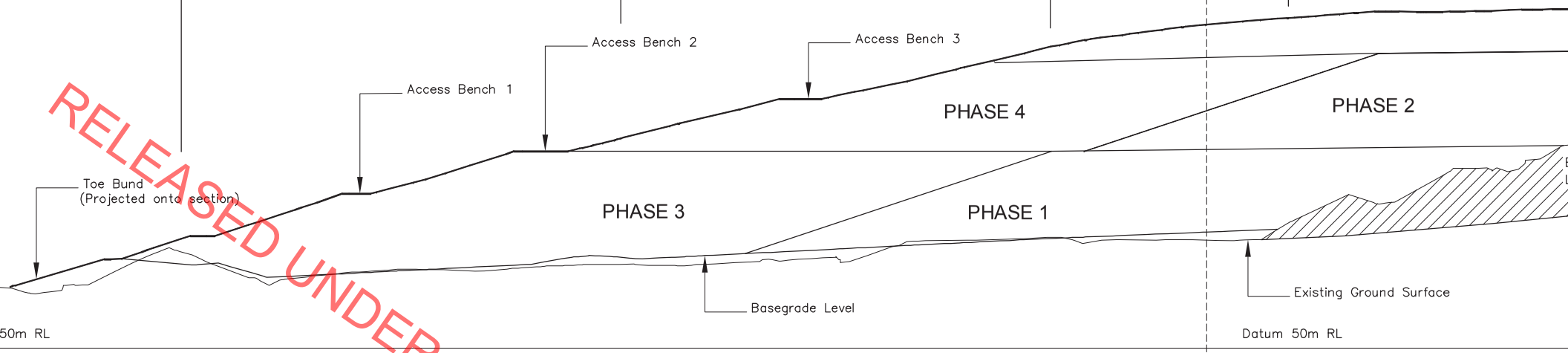

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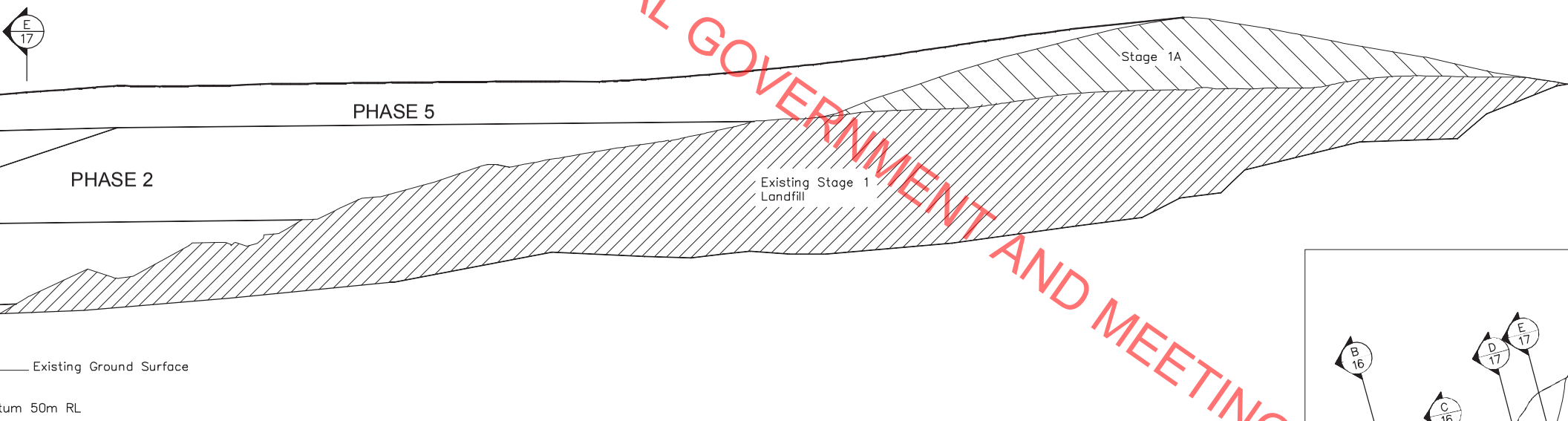

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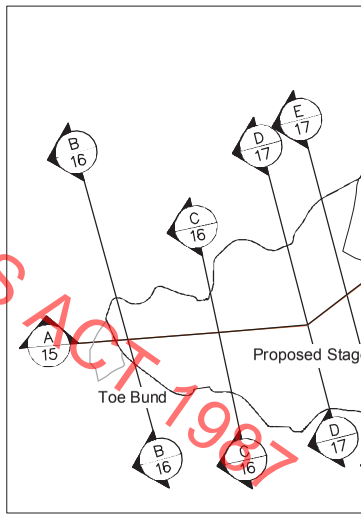

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Job No: 82948.210
26 January 2022

Hutt City Council | Te Kaunihera o Te Awakairangi
30 Laings Road
Hutt Central
Lower Hutt 5010

Attention: Diljinder Uppal

Dear Dil

Phase 3 Access - Addendum to Phase 3 Access Options Memo

1 Background

This report has been undertaken in accordance with our LoE dated 16 July 2021, Specifically the "Provision of Specialist landfill Advice (82948.210) Task 2 – Phase 3 Access".

Further to our preliminary review of the phase 3 access options presented in our memo dated 18 June 2021, Council agreed in principle to the recommendations made by T+T to proceed with Option 2. Council requested that T+T undertake the following actions prior to developing Option 2 further:

1. Consult with and obtain input from the incumbent landfill contractors to challenge and sense check the proposal for phase 3 access and operation, and
2. Obtain a better understanding of the phase 3 operation elements.

Council have recently entered a procurement process for both the landfill operations contract and resource recovery park and so consultation regarding the phase 3 access with incumbent contractors was sought but deemed inappropriate. Subsequently, T+T held an internal workshop with an independent technical expert (outside of the project team) to address and challenge the options presented in our original memo. In addition to this, having now well developed the new landfill operations contract specification, we have undertaken sufficient work to gain a much better understanding of the phase 3 operation.

Development of the phase 3 access design to a 30% design is now required to include in the Tender Documents for the new Silverstream Landfill Operations Contract. This is to provide tenderers sufficient information to allow the phase 3 operation to be understood and priced. This memo provides feedback to Council on the outcomes of the workshop and latest understanding of the phase 3 access and operation prior to commencing work on a 30% phase 3 access design.

2 Design Challenge Workshop

An internal T+T workshop was held with the following individuals:

1. §7(2)(a) – T&T Landfill Technical Director (independent from project team)
2. §7(2)(a) – Silverstream Landfill Designer
3. §7(2)(a) – Silverstream landfill Project Manager and phase 3 access designer
4. §7(2)(a) – Civil Engineer

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Review of Design Options:

- A top-down approach to access phase 3 via phase 2 was discussed and considered the best option for access in terms of both capital development cost and the phase landfill operation. This favours Option 1 and 2.
- If the road was constructed bottom up from the base of the valley the road would continually get longer and steeper as Phase 3 develops, which would make the operation difficult. The bottom-up approach would also require significantly more capital development work than a top down access. This is because the base of the valley is narrow with steep slopes. The review team agreed that Option 3 was not recommended.
- The review team agreed that sending commercial vehicles to the base of the valley to phase 3 is a significant H&S risk and should be avoided. This will therefore require a waste transfer facility to be constructed in phase 2 for the initial phase 3 filling operation, and to transfer waste to phase 3 using articulated dump trucks or similar capable vehicle. Therefore Option 1 is not recommended and Option 2 is preferred.

Option 2:

- Option 2 as presented in the original design memo proposes a waste transfer facility in Gully W1/W2, which will require additional fill, liner protection and gas well relocation. Even with this work the turnaround and loading area still be a tight location for commercial vehicles.
- An alternative phase 3 transfer facility could be developed in the current phase 2 filling area, which is flat and will require minimal capital works. This option also provides an elevation difference, which can provide various options to load transfer trucks.
- Building the upper half of the access road as a double lane and the lower part as a wide single lane allow provision for commercial vehicles to drive down to the phase 3 tipping pad earlier and so limit the time material needs to be double handled by the Contractor.
- The access road fill could be constructed from waste if the slope next to it is lined. This would reduce the fill required and the cost of construction. This approach has been utilised already in the landfill development to date.
- The access road should be at a low enough grade to allow access for emergency vehicles access to Phase 3 in the event of an accident / fire. This was discussed as 1 in 8 (12%) maximum.
- Post meeting correspondence within T+T landfill designers regarding the appropriate grade for the access road include:
  - ARL, for the main access road into the landfill, WMNZ required that we design for 1V:12.5H (for commercial vehicles full trucks uphill).
  - Maximum slope of 1V:10H (10%) for an empty waste truck uphill
  - Maximum slope of 1V:12H (8%) for a full waste truck uphill
  - A 1:10 slope was created for Omarunui Area D development, HDC felt the 1:10 grade for a full truck downhill with the curves on that site was marginally safe.

Indicative Phase 3 Operation:

It is envisaged the phase 3 operation will include:

1. Construction of a phase 3 waste transfer pad to allow commercial vehicles to drop off refuse and for the contractor to cart refuse to phase 3.
2. Construction of the phase 3 access road to align with the phase 3 slopes 1 and 2 capital works programme.

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3. The landfill operator will cart refuse from the phase 3 transfer pad to the phase 3 cell during the initial phase 3 filling work. Cartage will be via articulated dump trucks or similar vehicles capable of traversing steep terrain.
4. The Contractor will need to operate two operational faces (phase 2 and phase 3) for a period of time during the initial placement of waste in phase 3 until such time as phase 2 works are complete and phase 3 is fully commissioned.

3 Preferred Phase 3 Access Option

It is important to note that T+T are proposing to develop the phase 3 access design to a 30% level design for inclusion in the Tender Documents. This will be sufficient for pricing but allows flexibility in the design process for the successful Contractor to share ideas, innovation and input into a final design at a later stage. This is in line with the wider project team desire to work collaboratively and the work ethic outlined in the new Contract Heads of Agreement.

Following the design challenge workshop, and with a better understanding of the phase 3 operation, the preferred phase 3 access option is 'Option 2' with the following design modifications:

1. Relocate the phase 3 waste transfer pad to the current phase 2 waste mass away from gully W1/W2. Doing so will provide more space for the transfer pad and will not limit options available to the Contractor and wider team when considering the phase 3 operation. This will require leaving a space in the current phase 2 airvoid for this purpose and will result in a short term loss of airspace. However, this airspace will be recovered during phase 4 of the landfill development.
2. Design the phase 3 access road as a dual lane road for the top section of road only and then transition to a single lane road. This will allow provision for commercial vehicles to access the phase 3 tip pad after the height of waste in phase 3 is sufficiently advanced up the valley. This will reduce the length of time required where the contractor needs to cart waste to phase 3 for disposal.
3. Consider whether additional landfill liner can be installed at the point the new access transitions from rock to landfill. This would allow fill to be placed using refuse rather than cleanfill.
4. To include for safety in design items identified in Section 3.1 of the original design memo.

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4 Applicability

This report has been prepared for the exclusive use of our client Hutt City Council | Te Kaunihera o Te Awakairangi, with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement.

We understand and agree that this report will be used by Hutt City Council | Te Kaunihera o Te Awakairangi in undertaking its regulatory functions in connection with the management of Silverstream Landfill.

Tonkin & Taylor Ltd

Environmental and Engineering Consultants

Report prepared by:

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s7(2)(a)

Project Manager

Authorised for Tonkin & Taylor Ltd by:

.....

s7(2)(a)

Project Director

S.G

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Tonkin+Taylor

NOTICE TO TENDERER

NTT-004

NTT Subject:	Tenderers Site Visit - Response to Questions	Date:	16/05/2022
Contract Name:	Silverstream Landfill Operations Contract	Contract Number:	AD22-2102
Tenderer:	All Tenderers	Job No:	82948.1000
Attn:	All Tenderers		
Copy to:	Jörn Scherzer, Diljinder Uppal		

Following the Tenderers site visits, we have received several questions relating to this tender. The questions and answers below address the majority of the matters raised (the rest, relating to services, will follow). Questions are shown in *italics* with responses shown in normal text.

1. *Volume 1 – Basis of Payment Section 2 Landfill Operation, Item 2.1 Kiosk Operation and Financial Management Page 142 (Page 7 of BOP).*

a. *Contractor required to maintain the weighbridge kiosk computer hardware & software; what condition are these in, who pays for upgrades to software and computers and how often does hardware need to be replaced – Principal's cost?*

   Note in volume 1 at Page 195 Item 3.4 Weighbridge Records advises Weightrax fee will be paid by the Principal – however does the fee include or exclude maintenance referred to above?

b. *BOP refers only to "maintenance of kiosk computer software."*

c. *Does the contractor have to supply new computers or are these available on site?*

d. *Please advise software proprietary brand. Weightrax is in the spec but* ***Landfill 3000*** *is in Volume 2 at 4.10.2 Density testing. Confirmed at site Visit to be Weightrax.*

The computers at the kiosk are new (March 2022) and are provided as part of the recent upgrade from Landfill 3000 to Weightrax operating system at the Principal's cost. The Principal will cover cost of leasing the software (and associated upgrades) and hardware costs. The landfill operator is expected to operate the software and maintain all records as per Specification.

The reference to Landfill 3000 in Volume 2 Item 4.10.2 is incorrect. This section will be deleted from the final version of the Landfill Management Plan. From 1st July 2022, all vehicles will be charged by weight.

Note that computers utilised in the landfill offices are owned and maintained by the Contractor.

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2. *Volume 1 – Basis of Payment Section 4 – Landfill Operations Item 4.2 Landfill Fees*

a. Do large customers open accounts with HCC – presumably not the Contractor

All customers will have accounts with the landfill operator, not Hutt City Council. Monies received are held in a HCC trust account.

b. Who authorises opening of trading accounts – presumably, HCC

Opening of trading accounts sits within the responsibility of the Contractor. However, note that the setting of landfill fees is the Principal's responsibility.

c. What is the process for customers opening accounts with HCC

Customers currently fill in an application form with the Contractor, and it is envisaged that a process in line with this could be used in the future.

d. Please clarify if commercial accounts are with HCC or the Contractor as at Item 2.1 document advises the Contractor shall not be liable for bad debts; however if the invoice is from the Contractor this is difficult to enforce. We recommend the Contractor act as an Agent of HCC and all invoices are issued on behalf of HCC.

We confirm that the Contractor will act as Agents for Hutt City Council. Invoices will be issued on HCC letterhead and Council will provide a GST number. The invoiced amount will be paid directly to the HCC Trust Account.

At present, HCC has a dedicated bank account (08) for the Silverstream Landfill. The operating EFTPOS machines are also linked to that account. Debtors are asked to bank direct into that bank account. The operator does not have signing rights over that account - if anything needs to be refunded (i.e. paid into there in error) then the operator will need to discuss this with HCC to resolve.

e. If the Contractor acting as an agent for HCC, a GST number will be required for the "trust account" and Gate fees and HCC will need to invoice the Agent / Trust account monthly for the gate fees so that the GST transaction can be completed, failing which the Contractor or Gate fee account will not be able to complete GST returns and will be out of pocket by the GST amount. Please clarify the process with respect to GST trail.

Please refer to the above answer.

f. Does HCC need to approve credit accounts – particularly if they are taking the credit risk?

HCC does not currently approve any credit accounts.

3. *Volume 1 – Basis of Payment Section 2 Landfill Operation, Item 2.6.3 Topsoil of final capping*

a. Supply and installation of imported topsoil – does HCC have any supplies of topsoil available?

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HCC does not have any supply of topsoil within its control, other than what may be available on-site in relation to borrow sites.

b. For the avoidance of doubt is there a specification / standard definition of topsoil available?

The earthworks specification currently does not define topsoil nor provide a specification for topsoil. Section 8.8 of the Specification addresses how topsoil shall be placed.

c. We recommend this be made into a Provisional Sum

We agree with this approach. Item 2.6.3 shall be replaced with a Provisional Sum of $250k.

A revised Schedule of Prices will be issued in due course.

4. *Can Council please confirm whether it is the Contractors responsibility to pay for the cost of utilities such as power, internet and water or the Principals?*

HCC pays for the electricity associated with the landfill offices.

The Contractor is required to pay for internet connection costs. There is an existing copper connection to the landfill, which we are looking to upgrade at the cost of the Principal.

We will confirm responsibility for water costs in due course.

5. *Volume 1 – Contract Specification – Item 1.17.1 Power Supply*

a. Please supply monthly usage and cost over last 12 months

A record of the costs of electricity in relation to the landfill offices has been supplied. However, as noted above, Council currently pays for the electricity associated with the landfill offices

6. *Please provide a list of sub-contractors undertaking the compliance testing on site. Is this a responsibility of the Landfill Ops Contractor or others?*

a. Water quality

b. Dust

c. Etc

Other than the monitoring to be Completed by the Landfill Operator described in Clause 5.5 of the Specification, all compliance testing is undertaken by Geotechnics through Tonkin and Taylor Ltd. Geotechnics and Tonkin and Taylor costs are borne by the Principal.

7. *Volume 1 Item 4.5 Waste Compaction Page 37 Contract Specification*

a. Volume 1 - Item 4.5 Waste Compaction Page – Void utilisation of 1 tonne / m3 – confirm this includes daily cover and roading materials ?

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This is correct. The void utilisation ratio is the tonnage over the weighbridge divided by the landfill volume used (difference between drone surveys). So daily cover, capping, roading material and settlement etc are all included in the 1 tonne/m^3 volume.

b. How is daily cover measured and added to refuse volumes to get void utilisation?

Daily cover is not directly measured as this is not required to calculate void utilisation.

c. Calls for uniform layers not more than 600 mm uniformly spread

This is to ensure good compaction is achieved, and layers of waste are not excessively thick.

8. *Volume 2 Site Management Plan Page 17*

a. Refuse density of 850 kg / m3

b. Calls for layers typically 1,000 mm depth loose – contradicts above. – Item 8 c.

The references to refuse density and layer depth in the Landfill Management Plan noted above are not correct and will be updated in the final version. The Specification is correct.

9. *Clarification on leachate collector drain pricing is shown as a single SOP item (item 2.7.5) but materials noted are vastly different in quality i.e. Nova coil vs HDPE SDR 11 PE 100 – states either or…???*

The leachate collection drain should be priced based on Detail D in the drawings.

We will update the Schedule of Prices to include and item for a collection drain with 160 novacoil and a separate item for a 160 dia SDR11 PE100 pipe.

A revised Schedule of Prices will be issued in due course.

10. *Volume 1 – Section 5.2 Carbon Reductions*

a. Baseline emissions Scope 1 and Scope 2 = 651 tonnes – please provide details on how the total of 651 tonnes is arrived at. We understand the items within each scope but require the breakdown in each of these areas so we can ascertain how realistic 488 tonnes is by 2030.

The 651t is the tonnage calculated for the period July 2020 to June 2021. The following sources of energy contribute to this footprint:

- Electricity (landfill offices)
- Diesel (bulk)
- Diesel and petrol (fuel cards)

Note that bulk diesel supplies account for over 98% of the carbon footprint.

Note that the Principal aims for a reduction of 50%, and considers that a reduction of 25% is considered necessary in light of the need to avoid dangerous climate change, and in line with New Zealand's reduction in its carbon budgets. Therefore, 25% is the bare minimum that the Contractor should achieve.

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b. *The amount of 651 tonnes appears low for the amount of equipment on site and work undertaken at present; please provide greater details and the split between Scope 1 and Scope 2*

The Principal notes that the majority of the current landfill operation's carbon footprint is due to the type and number of machinery and vehicles used. For assessment purposes, Tenderers are invited to provide detailed information on the proposed vehicles, expected mileage/usage, and estimated efficiency, in order to derive your expected carbon footprint on an annual basis. The Principal recognises that in the case of having to operate two tipping pads, emissions may be higher than otherwise would be the case during that time, and this should be reflected in the expected carbon footprint during that time. Any changes in the operational approach will be taken into account when confirming reduction objectives in the contract.

c. *Please advise who pays for the infrastructure upgrade particularly for electricity and confirm there is adequate capacity for charging of equipment.*

The current power supply to site is limited and it is understood that a power supply upgrade will be required for charging of, for example, heavy electric plant. The Principal will pay for any upgrade required to the power supply to support decarbonisation of plant.

Note that the electricity supplied to the landfill offices to be used by the Contractor is paid for by the Principal (albeit use of the building is within the control of the Contractor, and hence the emissions associated with the connection should be included in the above mentioned 651t).

11. *How is the operator expected to reduce carbon emissions if there will be two operational tip faces for a period of time?*

It is acknowledged that there will likely be an elevated level of emissions while two tip faces are operational. Overall, the Contractor is required to reduce emissions by 25% (minimum) by 2030, and this timeframe is considered achievable in light of the contract time frame. However, the Principal recognises that in the case of having to operate two tipping pads, emissions may be higher than otherwise would be the case during that time, and this will be taken into account when confirming reduction objectives in the contract.

12. *What is the approximate period of time required for operating two faces?*

As implied by the Schedule of Prices, the estimated period of time where transfer of waste from the phase 2 transfer pad to the phase 3 tip face is required is 3 years. The estimated time where two operational tip faces are required is 1 year. This may change depending on the landfill operation and so the Extra Over rates shall be paid on a monthly basis.

13. *Can Council confirm whether it is in the HCC roading contract that rotomillings are to be brought to Silverstream landfill.*

We confirm that all millings the from the HCC roading contract go to Silverstream landfill, this is a requirement of their contract.

14. *How frequently are rotomillings brought to landfill and what are the indicative quantities?*

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s7(2)(a)

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Office,Reynolds Bach Drive,Stokes Valley, Lower Hutt

	Total Energy - kWh	Total Energy - kWh	Total Energy - kWh	Total Energy - $	Total Energy - $	Total Energy - $
	2020	2021	2022	2020	2021	2022
Jan	82	645	934	$41	$122	$163
Feb	149	640	836	$75	$117	$146
Mar	159	776	895	$80	$139	$158
Apr	256	804	885	$89	$144	$154
May	409	1,081		$99	$182	
Jun	399	1,126		$89	$186	
Jul	648	1,576		$122	$247	
Aug	605	1,524		$117	$240	
Sep	360	1,213		$84	$200	
Oct	307	1,204		$78	$200	
Nov	627	883		$118	$155	
Dec	686	917		$127	$161	
	4,688	12,389	3,550	$1,119	$2,092	$621

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Tonkin+Taylor

NOTICE TO TENDERER

NTT-005

NTT Subject:	Services, Schedule of Prices & Survey	Date:	20/05/2022
Contract Name:	Silverstream Landfill Operations Contract	Contract Number:	AD22-2102
Tenderer:	All Tenderers	Job No:	82948.1000
Attn:	All Tenderers		
Copy to:	Jörn Scherzer, Diljinder Uppal		

1. *Volume 1 – Contract Specification – Item 1.6.5 Security Page "CCTV cameras and recording equipment shall be operated at all times."*

a. Who supplies these and where are the details – no obvious in the SOQ?

The landfill operator is responsible for providing site security and it is the Principal's expectation that the minimum level of security shall be similar to existing, which includes:

- Engagement of a suitable security firm (currently Recon Security)
- Nightly site visits/patrol car to the landfill using approved security firm (Recon currently check admin buildings and transfer station)
- Operation of CCTV cameras and control system. Currently there are cameras for:
    - The administration building
    - Car park area
    - Camera looking up Reynolds Bach Drive from the administration building
    - Camera looking towards the kiosk from the administration building

These costs shall be borne by the Contractor as part of Preliminary and General items.

2. *Can Council please confirm whether it is the Contractors responsibility to pay for the cost of utilities such as power, internet and water or the Principals?*

Refer also NTT 4 regarding power and internet.

Further to NTT 4, the Principal will pay for power supply to the administration building, power infrastructure upgrades and charging station. However, the cost of power for purpose of charging vehicles and heavy plant is viewed as a fuel and so an operational cost borne by the Contractor.

The Principal will pay for all water costs associated with landfill activities for the new contract.

3. *Volume 1 – Contract Specification – Item 1.17.2 Water Supply*

a. Please supply monthly usage and cost over last 12 months and

b. How much is the rate entitlement - volume?

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s7(2)(a)

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HCC /Waste Management Negotiation Meeting Minutes

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HCC /Waste Management negotiation meeting 9 September 2022 – HCC office

Attendees Joern Scherzer (HCC), §7(2)(a) (T+T), §7(2)(a) (Waste Management), §7(2)(a) (Waste Management), §7(2)(a) (T+T), §7(2)(a) (Facilitator), Diljinder Uppal (HCC) , §7(2)(a) (MBIE), §7(2)(a) (T+T)

Context from §7(2)(a):

There may be additional negotiation meetings required

Following the evaluation process, Waste Management were not the party identified as the preferred party. The panel worked through due diligence process to address statements and assumptions through tender process. There was a marginal difference in two parties prior to due diligence.

There was nothing to be overwhelmed about in the tender process and commitment to decarbonisation and collaboration was not really addressed. The tender response was something that §7(2)(a) would have assessed from a decade ago which leads to some worries how the waste industry views council contracts and management of council contracts. Many assumptions and assertions around relationships seemed more rhetoric then fact. §7(2)(a) stated that referees should be positives which was not reflected back by referees. As the panel moved through this process there was discussion around is this recoverable and what do we need to do to make sure we engage with a party to make sure they understand what the councils requirements are?

HCC is keen to see demarcation between the current operation and the new contract. They are looking for a step change in terms of reporting and need to understand that this will be taking place. There are site and phasing challenges in terms of the site so HCC need a partner who is proactive with options, ideas and innovations so they get a good outcome in terms of site delivery.

HCC need to see a clear articulation of the proposed resourcing table so when they are looking at transfer station as resource recovery unit, for example, we know good customer service interface will be.

Resourcing is a key thing. There needs to be solid support to site mangers and site staff in terms of notice to contractors.

Communication and reporting

Decarbonisation and low emissions, response to RFP for a company that is internationally savvy in terms of electrification seemed outdated. There needs to be discussion around how phasing can occur and assumptions about electrification from day 1 through the life of the contract. This is critical to HCC community outcomes. **Action for both HCC and WMNZ.**

Business Case to look at resource recovery services which needs to be separated from Waste Management's own development. **Action: Waste Management**

Irrespective of any past council contract, we are hoping that this contract lays the groundwork for an exemplary example of how things are done between council and waste contractors.

§7(2)(a) Agrees that contract was around 25 years old and needs to be updated.

§7(2)(a) Keen to see that this is a solid, fair and equitable contract with overarching relationship in terms of collaboration is what's important. Should be 'refer to contract' only when things go wrong rather than looking at what's not specifically written into the contract.

Maintenance and site stewardship

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The old contract was set up in 1992 and the contract documents are no longer fit for purpose. There has been a lot of effort made to update the contract to current standard. The specification has been completely re-written.

There was not much in the old contract in terms of maintenance and the new contract is very prescriptive about maintenance that is required. §7(2)(a) often talks to §7(2)(a) who has been there a long time and is very good but §7(2)(a) understanding is that there are not enough people to do the maintenance required. T+T do maintenance inspections which they then issue to §7(2)(a) Maintenance items can be on the list for a long time as §7(2)(a) thinks the item is not important or wants to do something else. §7(2)(a) is interested to hear how maintenance will be switched from a reactive to proactive approach. There are requirements under the quality plan which sets out erosion sediment control inspections and how quickly they will be actioned and some of these items have taken over a year.

ACTION: Does Waste Management understand the new specifications and are they prepared to make those changes?

§7(2)(a) Silverstream has been a legacy operation contract and there is recognition that site resourcing is not fit for purpose under this type of agreement. They are looking for a senior engineer landfill manager/branch manager who will be located on site who will address many of these issues.

§7(2)(a) The Silversteam branch manager will report directly to §7(2)(a)

§7(2)(a) Was in Auckland at an executive meeting where they discussed operational standards of landfills in New Zealand. They have undertaken to lift management standards at all sites, this will be company policy.

Joern: HCC is interested in what these standards would be and would like updates on progress made. There is a difference between Waste Management owned landfills and council owned landfills, will these standards filter down to the council owned landfills?

Joern: Previously all comms have been between HCC and §7(2)(a) which is frustrating. He doesn't want an inspection report with a photo of items that need to be fixed month after month with no progress made.

§7(2)(a) The overall standard of operation whether joint venture, council or owned will all be the same. The way Silverstream has operated in the last 5 years is a frustration for WMNZ so a move into the future will be a good thing.

§7(2)(a) What change is going to happen to make the way Silverstream is operating not a frustration for both parties in terms of access, and flow of information?

§7(2)(a) The site historically has had people in place for a longer time and things are done a certain way because that's the way it has always been done. The large number of extensions with no long term certainty has made it difficult to plan plant and resourcing as there was no clear view as to what's required. They can now start to look at how that looks and what is required to put a different level of professional management on site. §7(2)(a) is a great operations manager who has a huge amount of experience, however the site now needs an engineer or strategic manager.

§7(2)(a) Contract management was a relationship management role when they first took over Silverstream. HCC expectations and how waste is managed has changed.

§7(2)(a) How far away are we from seeing that resourcing structure?

§7(2)(a) §7(2)(a) is working on doing this currently, the recruitment process kicking off to find the person

§7(2)(a) Just the one person or is the structure changing?

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§7(2)(a) Would be useful to get an engineer in who can do survey controls rather than relying on Leach as we are currently doing.

§7(2)(a) Please share the structure as its built, no names are required, the resource allocation across the entire operations will be fine

§7(2)(a) The first step is to work out who the top person will be then fill in from there.

§7(2)(a) Mud on the roads is part of the silt control issues. There is not a good water supply at Silverstream. A wheel wash is needed or suitable alternative is required.

§7(2)(a) There needs to be a change in terms of site presentation and the impact on surrounding land/roadways from the landfill operation.

WMNZ are the landfill operator and overarching PCBU onsite, they should be the lead PCBU. HCC is looking for Waste Management to work with and manage these relationships better especially around health and safety. With the new person they will be able to look at this as part of the new contract.

Relationships with the other PCBUs need to be better an example of this is that Earthlink could not get access to the toilets so HCC had to organise a portaloo, issues like this need to change. The building is owned by HCC and all PCBUs on site should be able to use this building. This is one way to work on building relationships.

§7(2)(a) Agreed, it is an ongoing challenge, and is not sustainable in today's environment. Each company has responsibility and accountability but needs an overarching PCBU to oversee.

§7(2)(a) Happy for HCC to be involved in final part of recruitment process to discuss expectations of HCC with the potential new lead.

Dil: There has been a burden on HCC to gets things happening, many of these things should come from Waste Management.

§7(2)(a) §7(2)(a) has put name down as contractors rep in the tender response, is he the right person for that role?

§7(2)(a) That will change to reflect the changes that Waste Management are starting to make. It was the structure at the time of the RFP. The new lead onsite will manage the day to day operations.

§7(2)(a) This is a key role, contractors rep should be on site to supervise the works,.

§7(2)(a) May be amended to be the onsite lead, §7(2)(a) will be the Contractors rep for now. Will feed this information into the job description for the new person.

Joern: There is currently 1 kiosk operator and there was discussion about having 2 kiosk operators but can't recall from the bid documentation what assumptions were made around the number of people at the kiosk. The response only gave the total staff number and it was unclear of where staff were allocated.

Communication and Reporting

§7(2)(a) There needs to be a documented feedback or reporting loop around notice to contractor or engineer. T+T have not received one NTE. The current discussion is a big step to start which can be built on.

Joern: We need to make sure that everything is documented and signed off so that everyone is on the same page. Currently a NTC is sent as a PDF via email. Is there an electronic system where people can sign off ie Zendesk. There needs to be a collaborative discussion around what to do. **Do Waste Management have anything internally?**

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§7(2)(a) Some work needs to be done on getting KPI's right, we will come back with an overarching framework on the KPIs.

§7(2)(a) For the first year we should set out KPA's then governance decided on KPI's.

§7(2)(a) I agree.

Joern: With regard to KPI's, some things are very difficult to measure, they need to be simple and not take lots of time to get the data.

§7(2)(a) – Waste Management need to providing constructive feedback when requested to. HCC and T+T have at times asked for feedback and nothing comes back. If there is no feedback then a response is still required even if it is we have nothing to add or here's an option.

§7(2)(a) Feedback is really important at the moment as there are lots of key decision been made. Waste Management need to be on board on the direction we are taking and it's important for WMNZ to be able to manage the site.

§7(2)(a) It's reflected on how the old contract worked and how the relationship has been. Having the site in the best form and designed in the safest form as well is important.

§7(2)(a) Would like to break down the barriers as there are some critical decisions around Phase 3 so we need to work together.

Joern: HCC and T+T need to get better at sharing what we are working on and the challenges we are facing on site. We should restart contract meetings so we can say here's an issue and what's happening to fix it as well as what the next step is.

Customer correspondence, process and resourcing, primarily around any direct public communications and correspondence.

Joern: Regarding landfill price increases, what's happened in the past is that HCC sets charges which are not advertised until the draft annual plan comes out. Once this document is released Waste Management should be advising customers of these changes. The office at the landfill waits for final plan which is not finalised until the last week in June. The draft plan is a public document which is issued in April and it would be good to be proactive to advise customers ahead of increases.

Dil: This relates to account holders who regularly use Silverstream. HCC will advise non account holders through normal HCC comms.

Joern: Comms team has been recruiting a comms advisor who will focus on waste initiatives to help support HCC with customer comms in the waste space.

Joern: Would like to explore discount vouchers, would be up to Waste Management to let customers know about these.

§7(2)(a) Removing conflict around contractors representative is important. If they hold a governance role, this should be different from any role they hold further down.

Joern: We have the kerbside governance group which is not fully embedded yet. Meetings could be held together so there are no too many meetings.

§7(2)(a) Yes, that could work.

Decarbonisation

§7(2)(a) In the context of the response there are lots of opportunities and firm commitments are needed. We need to get a clear plan around viability which sits in the core agreement and move beyond that to understanding what commercially viable solutions are available. Things are moving

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so rapidly in the commercial space so there needs to be some flexibility. Collectively we need to make a decision about what needs to be implemented.

Joern: ThunderGrid will roll out 4 charging units at the landfill. Part of this work is to electrify 4 car parks.

s7(2)(a) There is not much power available at the site so are currently looking at options for high voltage, either a new transformer or generating power. Initial discussions are underway and it looks like we will be taking power from the power station. Discussion is needed about requirements for heavy plant charging for Waste Management. HCC don't want heavy commercials on roads so need to discuss where infrastructure can be located for heavy vehicles to be charged.

Joern: There will be an innovation fund of $200K a year to fund new items including additional gear. We might not need to spend all of it and are also looking at EEKA for co funding. We would fund it as a joint piece of work which needs to tie in with the fleet guys as to how to decarbonise the site. Early indications are that some options are not feasible. The next step is to put the work in to create a path.

s7(2)(a) Lots of experience came through in the tender response but there needs to be more acceptance of risk. We are looking for site to be an exemplar of decarbonisation.

s7(2)(a) Have had similar conversations. Waste Management are part of ongoing with a university and offshore partners. It was an Interesting catalyst going through the RFP document. There is a bit of work going on around yellow gear. Had really only looked at fuel efficiency but this has brought that work back to the top. All light vehicle fleet is electric and utes are currently in the process of being replaced with electric. There has been no off the shelf solution available in many instances so Waste Management have had to do their own work. The trucks they have converted and operated are better than what is available off the shelf. Have started a round of discussions with yellow gear suppliers around NZ availability and how can items be bought into NZ, looking at all sites.

s7(2)(a) There is a front end loader in the contract, litter truck and utes, where are you with these?

s7(2)(a) Currently looking at some viable units that can be used. There are some issues around electric vehicles ie trucks where they can't go through standard wheelwashes due to their batteries.

s7(2)(a) Manufacturers of large electric vehicles are aligning with large mining operations to do their R&D and Waste Management trying to tap into that process. Research during the RFP process is that mid-size vehicles have slightly higher capital cost but, lower running costs so the whole of life is not dissimilar with the assumption that the cost is neutral.

Joern: When we pull together the schedule, given its now 6 months down the track, lets add it in, things have moved on. s7(2)(a) work will drive some of this. Need to have charging infrastructure in place.

s7(2)(a) The alternative tender did not have enough information to allow the panel to move forward but we can discuss a bit later down the track and pick apart.

s7(2)(a) happy to do that.

s7(2)(a) Routine governance meetings will have standard agenda options of decarbonisation.

s7(2)(a) Definitely, we have set some reasonably tight targets and are under no illusions it will be easy to meet with the extent of heavy plant we have.

Joern: **Will get back in touch with s7(2)(a) and set up a separate conversation** just on the decarbonisation aspect. s7(2)(a) to facilitate. This will input into contract negotiations but also feeds into the actual contract.

Diversion and Resource Recovery.

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§7(2)(a) When we wrote this document we were unsure of the life of the transfer station and tried to structure so Council can have it for at least 2 years with that in mind we left flexibility if it runs over or the decision is made to keep it.

Joern: What is there and how do we improve it. There have been lots of changes made over the last 3 years. There is a draft business case around staying or moving with big asset costs coming up if we make fundamental changes however there are some things we can improve without waiting for that. Things we need to think about are how do we get access for commercial gantry trucks and how do we manage from a heath and safety perspective to keep commercials separate from light vehicles. Need to put some thought into the voucher system, how do we make it happy quickly? Also need to think about signage, something like at Waitakere with big signs with gate numbers, rather than directing to hazardous waste drop off.

§7(2)(a) In terms of the transition of current operations, there is the opportunity to start early, ie concierge directing transfer station traffic. We need to collaborate around defining the future.

Joern: There are some things we can encourage eg someone to help meeting customers, are there health and safety reasons why they can't help customers? What happens once stuff has been put into the pit, how we make it happen to pull out useful stuff out of the pit?

§7(2)(a) Our experience with this sort of operation is that you have to take the overall objective of recovering everything and working with what you want to recover. There needs to be a plan of where material is going to go. Recovery is the start of the process. We need to start at what we can tick off quickly and how do we do that and manage risk. Waste Management already do this at different sites around that country so can bring that experience to Silverstream.

Joern: PCC has funding of around $300k to put in C&D recovery facility over the next 2-3 years with materials going to Silverstream. We need to confirm what they want, how the materials are to be collected and where it goes to. Focus is on where there is a market for the material.

Dil: How do we tap into the resource recovery experience, community and commercial application of where do the materials go. Keen to pull on experience around New Zealand.

§7(2)(a) In the past metals were salvaged on the tip face this stopped after some H&S incidents so this can't be done again, are there ways we can salvage metals from the tip face?

§7(2)(a) That all involves mechanical separation which needs a machine and an operator who is doing the work, need to look at how the recovery impacts the rest of the operation and what are the operational priorities? Initial focus should be on getting a good separation process going and once people are aware of the separation process they can get a voucher at the transfer station. Make it easier and cheaper than the alternative which will drive behaviour change. Waste Management preference is to minimise the complexity of what goes on at the tip face at a landfill.

Joern: Would like vouchers system up and running and signage up in the next 3 months. Needs to involve Earthlink as they will be involved in the voucher scheme.

§7(2)(a) Next steps are to pull together the final pieces of the contract. We talked about transition timeline around decarbonisation and a transition plan. Gantt chart of stuff to work on and where it fits in with the existing contract and the new contract. The immediate plan is to get the contract in place to enable us to give feedback to both parties.

Equipment resourcing confidence.

§7(2)(a) Loader lead time, around 23 months.

§7(2)(a) Compacter lead time is 14-24 months depending on size.

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§7(2)(a) Existing gear will be managed until end of life. They have bought a compactor up from Kate Valley, so are able to bring equipment from other sites. They are ordering now to get gear as quickly as possible. Bearing in mind that lead times are quite changeable with lots happening in the global economy so it's not unreasonable to expect some orders in other parts of the world may be cancelled which may mean items become available sooner. Also gear that is not new may become available.

§7(2)(a) We need concrete information on this document, council needs confidence that items will last.

§7(2)(a) Appreciate that with contract rollovers and uncertainty it is difficult to order items.

§7(2)(a) Nothing further to cover from WMNZ respective, great to cover expectations.

Next Meeting: 22nd September 9am-11am

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HCC Council negotiations meeting # 2 – 9am-11am, 22 September 2022

Attendees: s7(2)(a) (facilitator),

Jörn Scherzer (HCC)

s7(2)(a) (Waste Management),

s7(2)(a) (Waste Management),

s7(2)(a) (T+T),

s7(2)(a) (T+T),

s7(2)(a) (MBiE) via Teams

s7(2)(a) (T+T, Minutes).

Updates from previous meeting

s7(2)(a) (Retyna) has been engaged (as per proposal on assessment of decarbonisation initiatives for vehicle and yellow gear) and work has started with a site visit on 20 September. Work is being done in parallel with T+T who are investigating power supply options and potential to work with LMS Energy to source power from the power station.

s7(2)(a) provided a draft organisation chart outlining resourcing as per bid. s7(2)(a) confirmed that Waste Management are proposing to increase site staff by 3.0 FTEs. Waste Management advised the Branch Manager once appointed may adjust the detailed resourcing requirements within the allocated number. While Council has an interest in resourcing arrangements, particularly at management and supervisor level, it is Waste Management's obligation to ensure that the contract is adequately resourced.

Agreement on Decarbonisation

Waste Management have undertaken (in their tender submission) to swap in low carbon/emissions options when they become viable. s7(2)(a) advised definition of 'viable' used by Waste Management for the response is the same as or better than equivalent that is available today. A whole of life assessment of use and cost will inform this viability assessment. For example, if a viable electric digger becomes available then they will replace the current digger with a viable electric option and without cost penalty. Waste Management are committed to this and the conventional equipment being swapped will be repurposed across the WMNZ wider company operation. WMNZ noted their acceptance of this risk.

s7(2)(a) will provide a statement as a starting point for discussion on an agreed approach to determining viability of low or no emission equipment. Once agreed this will be documented in the Contract Agreement.

Next meeting:

Material to be Circulated by 30 September

Negotiations Meeting #3 10 October 2pm-4pm on Microsoft Teams, Kelly to forward invite.

Agenda Item	Description	Responsibility	By
Contract Document - Contract wording has been tidied up. Staffing changes,	s7(2)(a) to provide Waste Management with draft contract showing tracked changes.	s7(2)(a)	22 Sept

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Agenda Item	Description	Responsibility	By
decarbonisation and governance areas to be documented in the contract.	Review updated document and provide comments Initial comment	s7(2)(a)	30 Sept
Org Chart.	Provide updated Org chart to Kelly for distribution. To be colour coded to show changes to material roles and to map against roles noted in bid response.		30 Sept
	Provide job descriptions of material roles and brief descriptions of other roles for org chart.		30 Sept
Decarbonisation.	HCC to propose a framework for identifying and progressing innovative opportunities in the context of the governance structure for the contract.		30 Sept
	Create a timeline on availability of equipment as anticipated in the WMNZ tender and clarifications.		30 Sept
	Waste Management to propose a framework for determining when low/no emissions equipment are 'viable'. Principle to be agreed and included in the Contract Documents.		30 Sept
Heads of Agreement Document - Some areas need to be revised and decarbonisation needs to be added. Look at Kerbside contract.	Jörn to send s7(2)(a) kerbside collection partnership components document for review and updating with a view to having a consistent approach across both agreements.	Jörn	23 Sept
	Jörn and s7(2)(a) to advise any 'holes' in the kerbside partnership component documentation that we should address for the Silverstream Operations Contract	Jörn & s7(2)(a)	30 Sept
	Circulate draft partnership arrangements including decarbonisation components to be included in the HoA. Consider renaming the HoA.	s7(2)(a)	30 Oct
	Waste Management to review updated agreement and provide comments.		7 Oct
Transition Plan	Waste Management to develop a draft for discussion and comment once the contract is in place. This will include collaboration to identify and implement short-term improvements at the transfer station and across the life of that contract portion.		20 days after contract signature

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HCC Silverstream Landfill Contract Meeting #3 Monday 2:00pm-2:30pm 17 October 2022

Attendees: s7(2)(a) (facilitator),
s7(2)(a) (Waste Management),
s7(2)(a) (Waste Management),
s7(2)(a) (T+T),
s7(2)(a) (T+T),
s7(2)(a) (MBiE) via Teams
s7(2)(a) (T+T, Minutes).

Apologies: Jörn Scherzer (HCC)

Next meeting 2pm 30 minutes Tuesday 25 October

Agenda Item	Description	Update	Responsibility	By
Contract Document - Contract wording has been tidied up. Staffing changes, decarbonisation and governance areas to be documented in the contract.	s7(2)(a) to provide Waste Management with draft contract showing tracked changes.	s7(2)(a) has provided draft contract to Waste Management.	s7(2)(a)	
	Review updated document and provide comments Initial comment	Currently with legal team for final review 17/10.		17/10
Org Chart.	Provide updated Org chart to Kelly for distribution. To be colour coded to show changes to material roles and to map against roles noted in bid response.	s7(2)(a) has provided a number of documents related to org charts. s7(2)(a) mentioned that there were no key areas of responsibility for engagement with HCC..		
	Provide job descriptions of material roles and brief descriptions of other roles for org chart.	Job descriptions are not specific to the contract, are specific to roles within WMNZ. s7(2)(a) to send wording for Landfill		19/10

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Agenda Item	Description	Update	Responsibility	By
		Manager job description to s7(2)(a) for updating.		
Decarbonisation.	HCC to propose a framework for identifying and progressing innovative opportunities in the context of the governance structure for the contract.		s7(2)(a)	
	Create a timeline on availability of equipment as anticipated in the WMNZ tender and clarifications.	Working on summary of the equipment framework, locking in low carbon emission equipment and populating information about when new equipment comes online. WMNZ working on quotes and arrival dates. Will update spreadsheet as more information comes available.Live document to be updated as items ordered.		18/10
	Waste Management to propose a framework for determining when low/no emissions equipment are 'viable'. Principle to be agreed and included in the Contract Documents.			
Heads of Agreement Document - Some areas need to be revised and decarbonisation needs to be added. Look at Kerbside contract.	Jörn to send s7(2)(a) kerbside collection partnership components document for review and updating with a view to having a consistent approach across both agreements.			
	Jörn and s7(2)(a) to advise any 'holes' in the kerbside partnership component documentation that we should address for the Silverstream Operations Contract			
	Circulate draft partnership arrangements including decarbonisation components to			

Agenda item	Description	Update	Responsibility	By
	be included in the HoA. Consider renaming the HoA.	19 with some new words and consequential amendments for WMNZ legal review. WMMZ legal team on standby to look over. To be returned by 18/10.		
	Waste Management to review updated agreement and provide comments.	Had a go at updating commentary around relationship agreement. About 80% complete on commentary, Should be ready to go either 17 or 18/10. Some clarification required but no issues at this point.	s7(2)(a) [redacted]	18/10
Transition Plan	Waste Management to develop a draft for discussion and comment once the contract is in place. This will include collaboration to identify and implement short-term improvements at the transfer station and across the life of that contract portion.	Work in progress.		20 days after contract signature

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HCC Silverstream Landfill Contract Meeting #4 25 October 2022 2:00pm-2:15pm

Attendees: s7(2)(a) (facilitator),
s7(2)(a) (Waste Management),
s7(2)(a) (T+T),
s7(2)(a) (T+T),
Jörn Scherzer (HCC)
s7(2)(a) (MBiE)
s7(2)(a) (T+T, Minutes).

Apologies: s7(2)(a) (Waste Management),

Next meeting TBC

Description	Update	Responsibility	By
Contract documents to be compiled for signature	s7(2)(a) to check with WMNZ legal team if final version is the correct document	s7(2)(a)	
Transition of finalising the contract conversation to implementation planning exercise			
Everyone Happy with updated job description	Amendments made based on T+T feedback.		Completed
Good information on vehicle plans, proposed amendments around viability assessment	Job description and yellow gear information to be added to contract documents.		
Transition plan draft in progress			
Once contract signed get governance group established	Discussion in a couple of weeks time as part of contract discussion.		

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Description	Update	Responsibility	By
To decide who from TT can support Council and HCC in terms of transition process		s7(2)(a) [redacted]	
T+T to pull together post tender correspondance			

HCC /Waste Management negotiation meeting 9 September 2022 – HCC office

Attendees Joern Scherzer (HCC), s7(2)(a) (T+T), s7(2)(a) (Waste Management), s7(2)(a) (Waste Management), s7(2)(a) (T+T), s7(2)(a) (Facilitator), s7(2)(a) (HCC) , s7(2)(a) (MBIE), s7(2)(a) (T+T)

Context from s7(2)(a):

There may be additional negotiation meetings required

Following the evaluation process, Waste Management were not the party identified as the preferred party. The panel worked through due diligence process to address statements and assumptions through tender process. There was a marginal difference in two parties prior to due diligence.

There was nothing to be overwhelmed about in the tender process and commitment to decarbonisation and collaboration was not really addressed. The tender response was something that s7(2)(a) would have assessed from a decade ago which leads to some worries how the waste industry views council contracts and management of council contracts. Many assumptions and assertions around relationships seemed more rhetoric then fact. s7(2)(a) stated that referees should be positives which was not reflected back by referees. As the panel moved through this process there was discussion around is this recoverable and what do we need to do to make sure we engage with a party to make sure they understand what the councils requirements are?

HCC is keen to see demarcation between the current operation and the new contract. They are looking for a step change in terms of reporting and need to understand that this will be taking place. There are site and phasing challenges in terms of the site so HCC need a partner who is proactive with options, ideas and innovations so they get a good outcome in terms of site delivery.

HCC need to see a clear articulation of the proposed resourcing table so when they are looking at transfer station as resource recovery unit, for example, we know good customer service interface will be.

Resourcing is a key thing. There needs to be solid support to site mangers and site staff in terms of notice to contractors.

Communication and reporting

Decarbonisation and low emissions, response to RFP for a company that is internationally savvy in terms of electrification seemed outdated. There needs to be discussion around how phasing can occur and assumptions about electrification from day 1 through the life of the contract. This is critical to HCC community outcomes. **Action for both HCC and WMNZ.**

Business Case to look at resource recovery services which needs to be separated from Waste Management's own development. **Action: Waste Management**

Irrespective of any past council contract, we are hoping that this contract lays the groundwork for an exemplary example of how things are done between council and waste contractors.

s7(2)(a) Agrees that contract was around 25 years old and needs to be updated.

s7(2)(a) Keen to see that this is a solid, fair and equitable contract with overarching relationship in terms of collaboration is what's important. Should be 'refer to contract' only when things go wrong rather than looking at what's not specifically written into the contract.

Maintenance and site stewardship

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Schedule 27 - Specification Appendices

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Schedule 27 - Specification (Part 2 of 2, Appendices)

Appendix A - Historical Refuse Data
Appendix B - Hutt City Council By Laws
Appendix C - Hazardous Waste Disposal Guidelines
Appendix D - Conductivity and Surface water monitoring
Appendix E - Reports and Inspections

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Appendix A - Historical Waste Data

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Note:

The information provided in this appendix has been taken from the landfills computer data base and is offered in good faith, but the Council takes no responsibility for its reliability.

Information in this appendix is:

- Total Waste Composition Silverstream Landfill January 2011 to December 2021
- Refuse Streams at Silverstream Landfill January 2011 to December 2021 (trend)
- Total Commercial and Domestic at Silverstream Landfill January 2011 to December 2021 (trend)
- Special, Cleanfill and Charity Waste at Silverstream Landfill January 2011 to December 2021 (trend)

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Table A-1: Waste Composition at Silverstream Landfill, 2011

Month	Domestic (Transfer station) (tonnes)	General Commercial (tonnes)	Special (tonnes)	Sludge (tonnes)	Cleanfill (tonnes)	Charities and recyclables (tonnes)	Total Commercial (tonnes)	TOTAL WASTE (tonnes)
Jan-11	1867	5365	224	161	0	0	5750	7617
Feb-11	1415	5284	223	175	0	0	5681	7097
Mar-11	1510	5862	285	220	0	0	6368	7877
Apr-11	1579	5021	284	189	0	0	5494	7073
May-11	1470	5817	222	181	0	0	6220	7690
Jun-11	1252	5581	198	181	0	0	5960	7212
Jul-11	1460	4928	595	230	0	0	5753	7213
Aug-11	1372	5121	166	160	0	0	5448	6820
Sep-11	1373	5630	224	172	0	0	6026	7399
Oct-11	1767	5709	223	203	0	0	6134	7902
Nov-11	1731	6669	185	223	0	0	7077	8808
Dec-11	2192	6578	408	163	0	0	7149	9341
Total-11	18988	67565	3237	2258	0	0	73060	92048

Table A-2: Waste Composition at Silverstream Landfill, 2012

Month	Domestic (Transfer station) (tonnes)	General Commercial (tonnes)	Special (tonnes)	Sludge (tonnes)	Cleanfill (tonnes)	Charities and recyclables (tonnes)	Total Commercial (tonnes)	TOTAL WASTE (tonnes)
Jan-12	1875	5664	127	182	0	16	5973	7847
Feb-12	1533	5549	212	192	0	9	5953	7486
Mar-12	1608	5452	217	184	0	11	5853	7461
Apr-12	1651	4785	242	96	0	11	5123	6774
May-12	1297	5378	235	116	0	9	5728	7025
Jun-12	1400	4719	163	136	0	8	5018	6418
Jul-12	1368	5012	143	86	0	16	5242	6610
Aug-12	1266	5430	202	154	0	23	5786	7051
Sep-12	1339	5041	154	126	0	17	5321	6660
Oct-12	1513	6077	344	117	0	19	6538	8051
Nov-12	1576	5487	148	97	0	28	5732	7309
Dec-12	1598	5218	184	99	0	14	5501	7099
Total-12	18025	63814	2370	1585	0	181	67769	85793

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Table A-3: Waste Composition at Silverstream Landfill, 2013

Month	Domestic (Transfer station) (tonnes)	General Commercial (tonnes)	Special (tonnes)	Sludge (tonnes)	Cleanfill (tonnes)	Charities and recyclables (tonnes)	Total Commercial (tonnes)	TOTAL WASTE (tonnes)
Jan-13	1622	6995	174	144	0	20	7314	8936
Feb-13	1435	6423	191	128	0	20	6742	8177
Mar-13	1548	6231	627	82	0	7	6940	8488
Apr-13	1562	6363	860	111	0	10	7334	8896
May-13	1608	6942	206	160	0	11	7308	8916
Jun-13	1403	6222	173	135	0	8	6530	7933
Jul-13	1429	7135	281	137	0	35	7552	8982
Aug-13	1608	7437	163	95	0	30	7695	9303
Sep-13	1534	6901	281	120	0	29	7302	8835
Oct-13	1661	11428	227	145	0	21	11800	13461
Nov-13	1558	8356	547	126	0	37	9029	10586
Dec-13	1787	7944	283	127	0	30	8354	10141
Total-13	18755	88376	4013	1510	0	257	93899	112654

Table A-4: Waste Composition at Silverstream Landfill, 2014

Month	Domestic (Transfer station) (tonnes)	General Commercial (tonnes)	Special (tonnes)	Sludge (tonnes)	Cleanfill (tonnes)	Charities and recyclables (tonnes)	Total Commercial (tonnes)	TOTAL WASTE (tonnes)
Jan-14	1637	8422	602	139	0	42	9162	10800
Feb-14	1166	7935	250	124	0	23	8309	9475
Mar-14	1328	7504	275	124	0	14	7903	9231
Apr-14	1475	7383	397	104	0	13	7885	9360
May-14	1256	7297	198	156	0	14	7650	8906
Jun-14	1402	7852	712	129	0	14	8693	10095
Jul-14	1313	7530	5249	132	0	32	12911	14224
Aug-14	1369	7490	1114	97	0	33	8701	10070
Sep-14	1528	7932	1681	89	0	36	9702	11231
Oct-14	2105	9666	514	59	0	19	10238	12343
Nov-14	1889	8884	309	104	0	23	9297	11186
Dec-14	2249	8637	361	120	0	25	9118	11367
Total-14	18717	96532	11663	1376	0	289	109571	128288

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Table A-5: Waste Composition at Silverstream Landfill, 2015

Month	Domestic (Transfer station) (tonnes)	General Commercial (tonnes)	Special (tonnes)	Sludge (tonnes)	Cleanfill (tonnes)	Charities and recyclables (tonnes)	Total Commercial (tonnes)	TOTAL WASTE (tonnes)
Jan-15	2185	7892	314	78	0	13	8283	10468
Feb-15	1480	7020	381	59	0	20	7460	8940
Mar-15	1431	7517	600	87	0	20	8204	9635
Apr-15	1562	9156	347	70	0	32	9572	11134
May-15	1380	7680	331	70	0	36	8081	9460
Jun-15	1257	7657	420	57	0	35	8134	9390
Jul-15	1209	7389	351	78	0	40	7818	9027
Aug-15	1328	6603	346	104	0	36	7053	8381
Sep-15	1306	7263	321	102	0	47	7686	8992
Oct-15	1812	8042	293	77	0	34	8411	10223
Nov-15	1676	7550	288	83	0	42	7920	9596
Dec-15	2167	8272	389	136	0	21	8797	10965
Total-15	18792	92040	4380	999	0	377	97419	116211

Table A-6: Waste Composition at Silverstream Landfill, 2016

Month	Domestic (Transfer station) (tonnes)	General Commercial (tonnes)	Special (tonnes)	Sludge (tonnes)	Cleanfill (tonnes)	Charities and recyclables (tonnes)	Total Commercial (tonnes)	TOTAL WASTE (tonnes)
Jan-16	2137	6973	538	78	0	42	7589	9726
Feb-16	1717	7217	1154	84	0	20	8456	10173
Mar-16	1768	7683	380	66	0	31	8129	9896
Apr-16	1702	7753	1183	65	0	25	9000	10702
May-16	1389	7771	363	96	0	11	8230	9619
Jun-16	1383	8241	380	93	0	10	8714	10097
Jul-16	1429	7078	367	77	0	33	7522	8950
Aug-16	1332	7574	693	83	0	36	8350	9682
Sep-16	1409	7478	1396	494	0	43	9368	10776
Oct 2016	1857	7861	1121	56	0	34	9038	10895
Nov 2016	1607	7429	1511	42	0	25	8982	10589
Dec 2016	2329	8650	2403	72	0	79	11125	13454
Total-16	20059	91706	11489	1306	0	389	104501	124560

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Table A-7: Waste Composition at Silverstream Landfill, 2017

Month	Domestic (Transfer station) (tonnes)	General Commercial (tonnes)	Special (tonnes)	Sludge (tonnes)	Cleanfill (tonnes)	Charities and recyclables (tonnes)	Total Commercial (tonnes)	TOTAL WASTE (tonnes)
Jan 2017	2222	7475	545	78	0	39	8098	10320
Feb 2017	1752	7475	395	77	0	56	7946	9698
Mar 2017	1720	8348	348	95	0	33	8791	10511
Apr 2017	1883	7152	438	67	0	27	7657	9540
May 2017	1427	8008	500	95	0	33	8603	10029
Jun 2017	1461	7048	928	87	0	11	8062	9523
Jul 2017	1423	7048	427	85	0	23	7560	8983
Aug 2017	1321	7756	433	87	0	26	8276	9597
Sep 2017	1586	7164	1391	92	0	40	8647	10233
Oct 2017	2112	8336	580	83	0	66	8999	11112
Nov 2017	1973	7521	910	80	0	69	8512	10485
Dec 2017	2255	7528	413	52	0	37	7993	10248
Total-17	21136	90859	7307	977	0	460	99144	120280

Table A-8: Waste Composition at Silverstream Landfill, 2018

Month	Domestic (Transfer station) (tonnes)	General Commercial (tonnes)	Special (tonnes)	Sludge (tonnes)	Cleanfill (tonnes)	Charities and recyclables (tonnes)	Total Commercial (tonnes)	TOTAL WASTE (tonnes)
Jan 2018	2259	8280	499	71	0	37	8850	11109
Feb 2018	1897	7224	430	72	0	25	7726	9624
Mar 2018	1823	7584	1282	63	0	26	8929	10752
Apr 2018	1720	6999	939	76	0	29	8014	9734
May 2018	1535	6944	563	56	0	40	7563	9098
Jun 2018	1490	6702	437	75	0	22	7214	8704
Jul 2018	1569	6504	2603	70	0	32	9176	10746
Aug 2018	1541	6962	5738	80	0	47	12780	14320
Sep 2018	1760	6829	424	62	0	48	7315	9076
Oct 2018	1956	7458	396	69	0	61	7923	9880
Nov 2018	1806	7207	1015	72	202	52	8295	10101
Dec 2018	2735	7365	478	72	155	43	7915	10650
Total-18	22092	86059	14805	837	357	462	101701	123793

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Table A-9: Waste Composition at Silverstream Landfill, 2019

Month	Domestic (Transfer station) (tonnes)	General Commercial (tonnes)	Special (tonnes)	Sludge (tonnes)	Cleanfill (tonnes)	Charities and recyclables (tonnes)	Total Commercial (tonnes)	TOTAL WASTE (tonnes)
Jan 2019	2433	7372	364	96	775	54	8661	11923
Feb 2019	1804	6507	389	65	32	31	6961	8829
Mar 2019	1932	7560	4616	76	133	56	12252	14372
Apr 2019	1795	7297	5555	101	48	45	12953	14841
May 2019	1815	7760	3114	54	52	31	10928	12825
Jun 2019	1732	6289	2633	37	29	28	8958	10748
Jul 2019	1472	7231	2930	47	35	45	10208	11760
Aug 2019	1602	7124	1980	83	7	55	9187	10851
Sep 2019	1769	7422	2255	100	51	47	9776	11643
Oct 2019	1964	8051	730	122	529	46	8903	11441
Nov 2019	2019	8169	562	101	975	55	8831	11881
Dec 2019	2543	8003	637	120	872	44	8760	12218
Total-19	22881	88785	25765	1000	3537	536	116379	143332

Table A-10: Waste Composition at Silverstream Landfill, 2020

Month	Domestic (Transfer station) (tonnes)	General Commercial (tonnes)	Special (tonnes)	Sludge (tonnes)	Cleanfill (tonnes)	Charities and recyclables (tonnes)	Total Commercial (tonnes)	TOTAL WASTE (tonnes)
Jan 2020	2454	7582	630	120	712	41	8332	11539
Feb 2020	1928	7128	2663	95	1427	29	9885	13269
Mar 2020	1616	7221	1995	129	905	22	9345	11887
Apr 2020	0	6085	333	91	0	9	6510	6519
May 2020	1522	8286	1996	89	503	40	10371	12436
Jun 2020	1720	8486	1091	117	74	38	9694	11526
Jul 2020	1747	8312	2602	124	76	31	11038	12892
Aug 2020	1926	7992	2586	105	56	58	10682	12722
Sep 2020	1749	8375	1137	149	43	52	9662	11505
Oct 2020	2132	9069	1155	118	94	66	10343	12635
Nov 2020	2065	8989	7516	149	160	53	16655	18932
Dec 2020	2534	9373	4457	202	56	39	14032	16662
Total-20	21393	96899	28160	1489	4107	477	126548	152524

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Firure A-1: Silverstream Landfill Refuse Streams

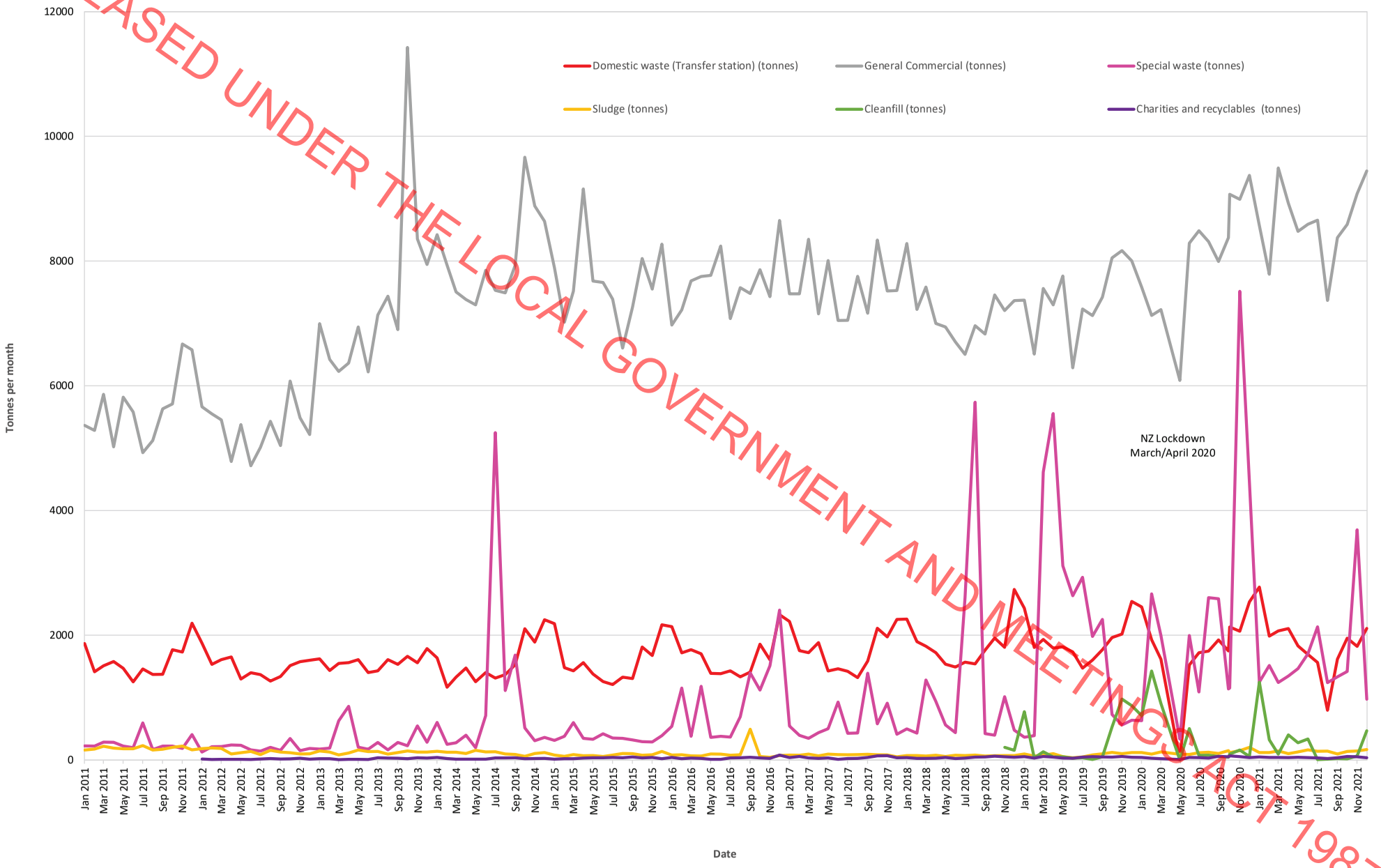

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Figure A-2: Total Commercial and Domestic Waste at Silverstream Landfill

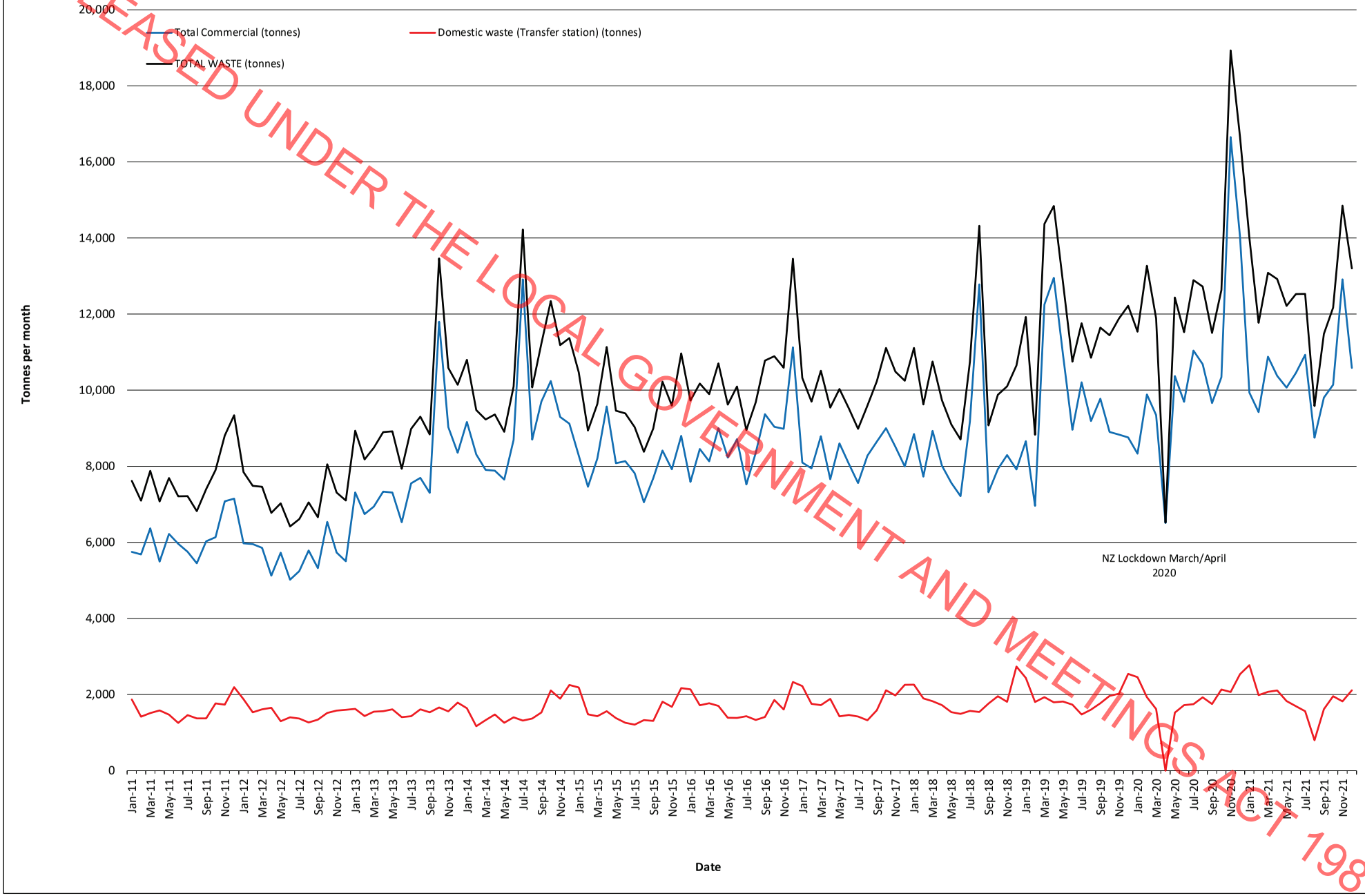

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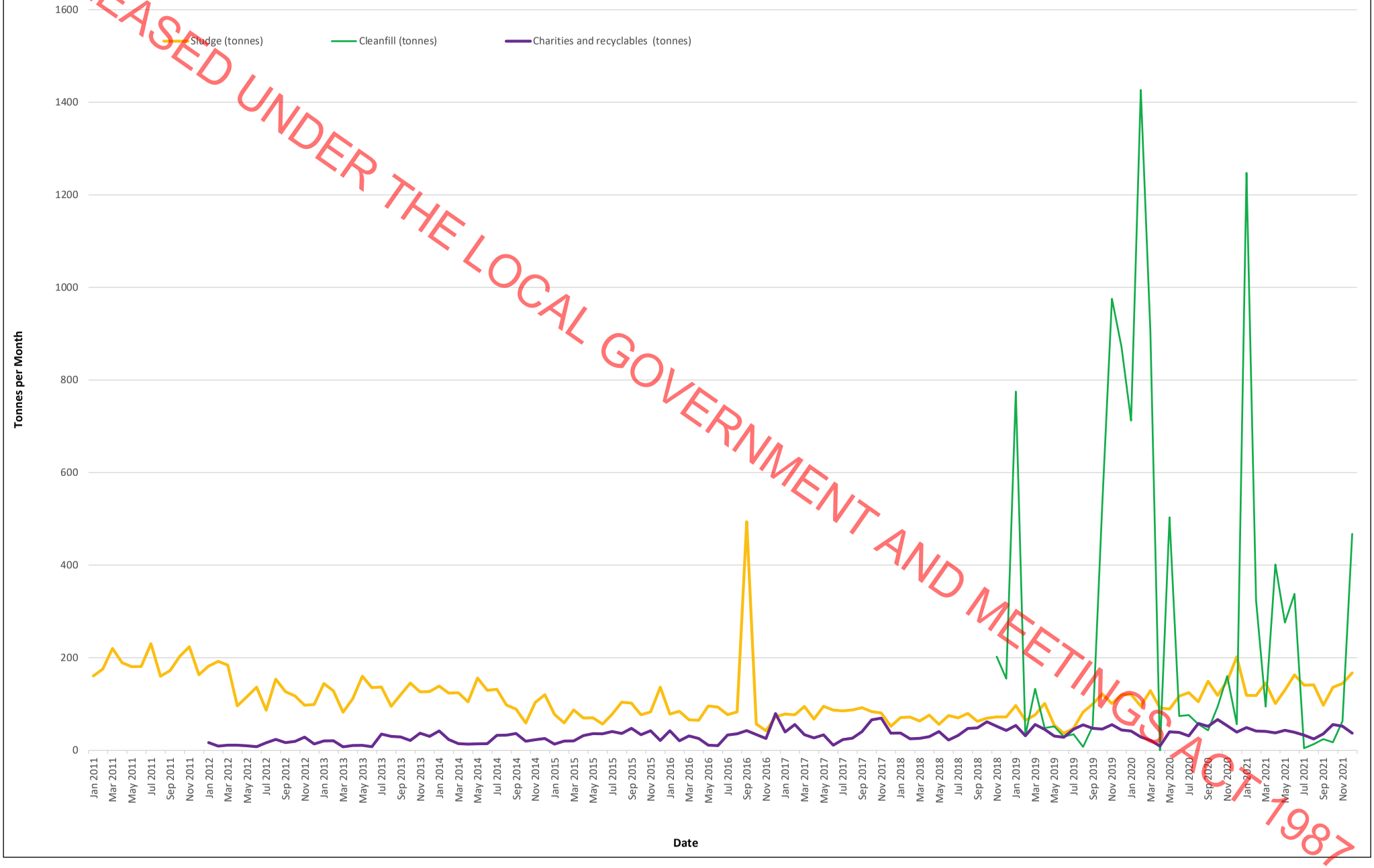
Figure A-3: Special, Cleanfill and Charity Waste at Silverstream Landfill



Appendix B - Hutt City Council Bylaws

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HUTT CITY COUNCIL SOLID WASTE MANAGEMENT AND MINIMISATION BYLAW 2021

EFFECTIVE 25 JANUARY 2021

HUTT CITY
TE AWA KAIRANGI

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Division	Sustainability and Resilience -
Date created	January 2021
Publication date	25 January 2021
Review period	January 2029
Owner	Jörn Scherzer
Approved by	Director Environment and Sustainability

Version	Author	Date	Description
V 1.0	Jörn Scherzer	25/01/2021	Approved by Council.

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PART A: INTRODUCTION		
1	**Title and Application**	1.1 The title of this Bylaw is the "Hutt City Council Solid Waste Management and Minimisation Bylaw 2021". 1.2 This Bylaw applies within the district of Hutt City Council.
2	**Commencement**	2.1 This Bylaw comes into force on 25 January 2021 except for the following exceptions which come into force on the date specified: a) The licensing provisions in clause 11 come into force two years after the commencement date of this bylaw; and b) The event waste management plan provisions under clause 13 come into force one year after the commencement date of this bylaw.
3		3.1 This Bylaw supersedes the Refuse Collection and Disposal Bylaw 2008.
4	**Purpose**	4.1 The purpose of this Bylaw is to support: a) The promotion and delivery of effective and efficient waste management and minimisation in Lower Hutt City as required under the Waste Minimisation Act 2008; b) The implementation of the Wellington Region Waste Management and Minimisation Plan; c) The purpose of the Waste Minimisation Act 2008 and the goals in the New Zealand Waste Strategy 2010, being to encourage waste minimisation and a decrease in waste disposal in order to protect the environment from harm; and provide environmental, social, economic, and cultural benefits; d) The regulation of waste collection, transport and disposal, including recycling, waste storage and management;

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<table>
<tr><td></td><td></td><td>e) Controls regarding the responsibilities of customers who use approved solid waste services, and the licensing of waste collectors and waste operators;

f) The protection of the health and safety of waste collectors, waste operators and the public; and

g) The management of litter and nuisance relating to waste in public places.

4.2 This Bylaw is made pursuant to section 56 of the Waste Minimisation Act 2008, sections 145 and 146 of the Local Government Act 2002, section 64 of the Heath Act 1956, and section 12 of the Litter Act 1979.</td></tr>
<tr><td>5</td><td>Compliance with Bylaw</td><td>5.1 No person may deposit, collect, transport, sort, process, treat or dispose of waste other than in accordance with this Bylaw.

5.2 To avoid doubt, compliance with this Bylaw does not remove the need to comply with all other applicable Acts, regulations, bylaws, and rules of law.</td></tr>
<tr><td>6</td><td>Interpretation</td><td>5.1 For this Bylaw, unless the context otherwise requires, the following term definitions apply[1]:

<table>
<tr><td>Term:</td><td>Means:</td></tr>
<tr><td>Act (the Act)</td><td>Waste Minimisation Act 2008</td></tr>
<tr><td>Advertising material</td><td>Any message which:
(a) Has printed content controlled directly or indirectly by the advertiser; and
(b) Is expressed in any language and communicated in any medium with the intent to influence the</td></tr>
</table>
</td></tr>
</table>

[1] For the avoidance of doubt, where this Bylaw relies on a definition in legislation and that definition changes, the definition in this Bylaw changes accordingly.

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	choice, opinion or behaviour of a person.
Approved	Authorised in writing by the Council.
Approved collection point(s)	Council approved places, facilities or receptacle where approved receptacles may be left for collection or waste may be deposited.
Approved receptacle	Any container, bag or other receptacle that has been approved by the Council for the collection of any type of waste or diverted material, with approval based on the following criteria: the prevention of nuisance, the provision for adequate security to prevent scavenging, the protection of the health and safety of waste collectors and the public, and the achievement of effective waste management and minimisation.
Authorised officer	Any officer of the Council or other person authorised by the Council to administer and enforce its bylaws, and any person appointed especially or generally by the Council to enforce the provisions of this Bylaw.
Building work	As defined in the Building Act 2004 and includes any work for, or in connection with, the construction, alteration, demolition, or removal of a building. It can include site work and design work relating to the building work.
Bylaw	This Solid Waste Management and Minimisation Bylaw 2021.
Cleanfill material	Waste that meets all of the following requirements: a) Does not undergo any physical, chemical or biological transformation that, when deposited or with the passing of time, is likely to have adverse effects on the environment or human health; and b) Includes virgin excavated natural materials such as clay, soil and rock, and other inert materials such as concrete or brick that are free of: i) Combustible, putrescible, degradable or leachable components; ii) Hazardous waste, hazardous substances or materials (such as municipal solid waste)

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	likely to create leachate by means of biological breakdown; iii) Products or materials derived from hazardous waste treatment, hazardous waste stabilisation or hazardous waste disposal practices; iv) Materials such as medical and veterinary waste, asbestos, or radioactive substances that may present a risk to human health or the environment; and v) Contaminated soil and other contaminated materials; and vi) Liquid waste; and (c) Has less than two per cent by volume by load of tree or vegetable matter.
Cleanfill	Land used for the disposal of cleanfill material.
Commercial or industrial waste	Waste (excluding trade waste) that results from a commercial or industrial enterprise and includes waste generated by the carrying on of any business, factory, manufacture, process, trade, market, or other activity or operation of a similar nature.
Construction and demolition waste	Waste generated from any building work (including renovation and repair); and includes but is not limited to concrete, plasterboard, insulation, nails, wood, brick, paper, cardboard, metals, roofing materials, wool/textiles, plastic or glass, as well as any waste originating from site preparation, such as dredging materials, tree stumps, asphalt and rubble.
Council	The Lower Hutt City Council or any person delegated or authorised to act on its behalf.
Deposit	To cast, place, throw or drop any waste or diverted material.
Dispose or Disposal	As defined in the Act.
Diverted material	As defined in the Act.
Donation collection	A place where approved types of waste may be deposited for the purposes of raising funds or the

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point	charitable reuse/recovery of the waste items.
Estimated value	As defined in the Building Act 2004.
Event	Any organised temporary activity of significant scale that is likely to create litter and includes (but is not limited to) an organised indoor or outdoor gathering, market, parade, sporting event, festival, concert, performance or celebration. An outdoor event will be considered significant if it has an expected attendance of 1,000 or more people across the duration of the event, whether it be a single or multi-day event. For the purpose of this Bylaw an outdoor 'event' excludes: • any regularly occurring recreational activities such as weekly sports events. An indoor event will be considered significant if it has an expected attendance of 1,000 or more people across the duration of the event, whether it be a single or multi-day event. For the purpose of this Bylaw an indoor 'event' excludes: • indoor private functions; and • any regularly occurring recreational activities such as weekly sports events.
Food waste	Waste that is derived from any item of food and is organic in origin and free of contamination and includes fruit and vegetable scraps, meat, fish, bone and shell discards, and any other similar food scraps.
Green waste	Organic plant material from gardening or arboriculture activities including lawn clippings, weeds, plants and other soft vegetable matter, which by nature or condition and being free of any contaminants will degenerate into compost.
Handled or Handles	Includes removing, collecting, transporting, storing, sorting, treating, processing or disposing of waste.
Hazardous substance	As defined in the Hazardous Substances and New Organisms Act 1996 and means, unless expressly

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	provided otherwise by regulations, any substance— a) With 1 or more of the following intrinsic properties: i) Explosiveness: ii) Flammability: iii) A capacity to oxidise: iv) Corrosiveness: v) Toxicity (including chronic toxicity): vi) Ecotoxicity, with or without bioaccumulation; or b) Which on contact with air or water (other than air or water where the temperature or pressure has been artificially increased or decreased) generates a substance with any 1 or more of the properties specified in paragraph (a).
Hazardous waste	Waste that: a) Contains hazardous substances at sufficient concentrations to exceed the minimum degrees of hazard specified by Hazardous Substances (Minimum Degrees of Hazard) Regulations 2000 under the Hazardous Substances and New Organisms Act 1996; or b) Meets the definition for infectious substances included in the Land Transport Rule: Dangerous Goods 2005 and NZ Standard 5433: 2007 – Transport of Dangerous Goods on Land; or c) Meets the definition for radioactive material included in the Radiation Protection Act 1965 and Regulations 1982. Hazardous waste does not include household waste, inorganic waste, construction and demolition waste, or commercial or industrial waste.
Home composting	The activity of aerobically decaying household organic waste (green waste and/or food waste) and other compostable items originating from that property to create compost at home. To avoid doubt, includes worm farms and anaerobic digestors.

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Household waste	Waste consisting of recyclable material, organic waste or residual waste originating from any residential household but does not include, commercial or industrial waste, prohibited waste, hazardous waste, trade waste, liquid waste, or construction and demolition waste.
Inorganic waste	Waste consisting of household equipment, furniture, appliances and material of a similar type that due to its nature or size cannot be collected as household waste in an approved receptacle, and that is specified by the Council as suitable for: a) Collection from a public place by the Council or an approved waste collector; or b) Collection from any premises by the Council or an approved waste collector; or c) Delivery to a resource recovery facility.
Landfill	As defined in the Technical Guidelines for Disposal to Land (Waste Management Institute of New Zealand)[2] or by Government standards or regulation.
Licence	A licence, consent, permit or approval to do something under this Bylaw and includes any conditions to which the licence is subject.
Litter	Any rubbish, animal remains, glass, metal, garbage, debris, dirt, filth, rubble, ballast, stones, earth, other residual waste or any other thing of a like nature that has been disposed of in a public place, other than in an approved receptacle or collection point for such disposal, or on private land without the consent of the occupier. For the avoidance of doubt this includes organic material, dog faeces in a container or bag, or disposable nappies.

[2] The guidelines can be accessed at http://www.wasteminz.org.nz/pubs/technical-guidelines-for-disposal-to-land-april-2016/

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Litter receptacle	A receptacle provided for the collection of litter.
Manager	A person who controls or manages any premises, activity or event, regardless of whether that person has a proprietary interest in those premises or that activity or event. For clarity, this includes the chairperson of a body corporate for a multi-unit development.
Multi-unit development	A multiple tenancy property comprising of 10 or more separately occupied residential units, whether in the same building or in separate buildings, and held either in common ownership or in separate ownership. This includes a unit title development, a mixed-use premise with business activities, and any development with controlled or restricted access, such as a gated community.
Nuisance	As defined in section 29 of the Health Act 1956 and includes anything offensive or injurious to the health of the community or any member of it.
Occupier	In relation to any property or premises, means the inhabitant occupier of that property or premises and, in any case where any building, house, tenement, or premises is unoccupied includes the owner.
Organic waste	Food waste and/or green waste that is specified by the Council under clause 7 of this Bylaw as organic waste.
Owner	In relation to any property or premises, means the person or persons entitled to receive the rack rent of the property or premises, or who would be so entitled if the property or premises were let to a tenant at a rack rent, and where such a person is absent from New Zealand, includes their attorney or agent.
Person	An individual, a corporation sole, a body corporate, and an unincorporated body.
Premises	Any separately occupied land, dwelling, building, or part of the same.

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Prohibited waste	Waste containing: a) Any material capable of causing injury to any person or animal unless the material is sufficiently contained to prevent injury; b) Any material capable of causing damage to the approved receptacle or likely to shatter and cause injury in the course of collection unless the material is sufficiently contained to prevent damage to the approved receptacle or to prevent injury; c) Any material that may endanger any person, animal or vehicle which may come in to contact with it prior to, during or following collection, transportation, storage, sorting or disposal; d) Any radioactive wastes, but excluding domestic smoke detectors; e) Any used oil and lead-acid batteries; f) Any hazardous waste; g) Medical waste including wastes generated at health care facilities, such as hospitals, physicians' offices, dental practices, blood banks, pharmacies/chemists, and veterinary hospitals/clinics, as well as medical research facilities and laboratories; h) Any asbestos containing material; and i) Any material prohibited by the Council under clause 7 of this Bylaw.
Public place	a) A place that is under the control of Council or a Council-controlled organisation that, at any material time, is open to or is being used by the public, whether free or on payment of a charge; and b) To avoid doubt this includes any park, reserve, recreational ground, pool, community facility, sports field or facility, public open space, public garden, public square, cemetery, beach, foreshore, dune, wharf, breakwater, boat ramp, pontoon, road, street, lane, thoroughfare, footpath, access way, cycleway, bridleway, car park, grass verge, berm, and any part of the public place.

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Recovery	As defined in the Act.
Recyclable material or Recyclables	The types of waste that are able to be recycled and that may be specified by the Council from time to time under this Bylaw.
Recycling	As defined in the Act.
Reuse	As defined in the Act.
Rural areas	Any areas zoned and/or defined in the [insert name] District Plan as rural.
Site	For the purposes of this Bylaw means an area of land that is the subject of an application for a building consent or an area of land where a specific development or activity is located or is proposed to be located.
Specified intended life	As defined in the Building Act 2004.
Treatment	As defined in the Act.
Unaddressed mail	Any mail or material that does not display a full address and name of a person at that address.
Waste	As defined in the Act.
Waste collector	Any person or entity that collects and transports waste and includes commercial and non-commercial collectors and transporters of waste (community groups and not-for-profit organisations) but does not include individuals who collect and transport waste for personal reasons (for example, the owner taking their own household garden waste to a waste management facility).
Waste hierarchy	As defined by the Act
Waste management	A facility authorised by the Council which primarily provides waste treatment and disposal services or

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		facility	waste remediation and materials recovery services, in relation to solid waste. Includes but is not limited to waste transfer stations, resource recovery stations, recycling centres, composting facilities, landfills or clean fill sites, or hazardous waste facilities.
		Waste Management and Minimisation Plan or WMMP	A waste management and minimisation plan adopted by the Council under section 43 of the Act.
		Waste operator	Any person or entity that operates a waste management facility.
		Waste remediation and materials recovery services	The remediation and clean-up of contaminated buildings and mine sites, mine reclamation activities, removal of hazardous material and abatement of asbestos, lead paint and other toxic material. This also includes recovery, sorting, and/or storage services in relation to waste.
		Waste treatment and disposal services	The treatment or disposal of waste (including hazardous waste), including the operation of landfills, combustors, incinerators, composting, biodigesters and other treatment facilities (except sewage treatment facilities), and waste transfer stations.
7	**Controls**	7.1 The Council may make, amend or revoke controls to support the implementation of this Bylaw. 7.2 The controls made by Council under clause 7.1 may relate to but are not limited to the following matters: a) The type, size, capacity/volume, weight, number, colour and construction of approved receptacles that may be used for the disposal, storage and collection of waste and recyclable material; b) The types of household waste that may be treated for all purposes (including deposit, collection, transportation and disposal) as recyclable, organic waste, or other residual waste; c) The types and categories of waste that may be deposited in approved receptacles; d) The conditions applicable to any collection service from a public place, including the placement and retrieval of approved	

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receptacles for collection, collection days and times, and restrictions on the number and weight of approved receptacles;

e) Requirements to ensure the correct separation of wastes into approved receptacles, including content control messaging and symbology on an approved receptacle that specifies the permitted and prohibited content;

f) Maximum allowable limits of a specified waste type that may be deposited, collected or transported from a public place in an approved receptacle;

g) Maximum allowable limits of a waste type that may be placed in a receptacle that is approved for another type of waste

h) Types of waste that are prohibited;

i) The locations, access times and conditions of use of approved collection points

j) Requirements relating to the safe and secure transportation of waste;

k) Requirements applicable to waste service users and/or to waste handling and collection if traffic or pedestrian safety have the potential to be adversely impacted by the deposit of material in a public place or by waste servicing operations; and

l) Any other operational matter required for the safe and efficient operation of a waste collection service from a public place.

7.3 The Council must, before making, amending or revoking any control under clause 6.1, comply with the requirements under Subpart 1 of Part 6 of the Local Government Act 2002.

7.4 Any control made, amended or revoked under clause 7.1:

(a) Must be made by a resolution of Council that is made publicly available; and

(b) May:

i) Regulate, control or prohibit any matter or thing either generally, for any specified classes of case, or in a particular case;

ii) Apply to all waste or to any specified category or type of waste

iii) Apply to Lower Hutt City or to a specified part of Lower Hutt City and/or

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		iv) Apply at all times or at any specified time or period of time.
PART B: DEPOSIT, COLLECTION, TRANSPORTATION, STORAGE, PROCESSING AND DISPOSAL OF WASTE		
8	**General Responsibilities**	8.1 The occupier and/or the manager of a premises must ensure that the household waste from the premises is separated into waste types as determined by the Council and is deposited for collection in the correct approved receptacle. No person may deposit in a receptacle any material that is not approved for that type of receptacle. 8.2 The occupier and/or the manager of any premises must ensure that: a) All waste receptacles are appropriately secured to deter scavenging and to prevent waste escaping; b) Any waste receptacle is regularly emptied when it is full; and c) The contents of any waste receptacle are protected from rain, dispersal by wind, or ingress or egress of flies, vermin and animals. 8.3 The occupier and/or the manager of any premises must ensure that: a) All approved receptacles are kept in a safe location, are hygienic, in good repair, and are without any modifications or alterations to their appearance; b) The contents of any approved receptacle do not seep or escape so as to be injurious or dangerous to health, cause an offensive smell or be a source of litter; c) Waste is deposited in the receptacle in a manner that allows the whole of the contents to fall out easily and cleanly when the receptacle is emptied; d) The receptacle is placed upright either at an approved collection point or for collection in a position off the carriageway, in front of the premises from which the waste originated and as close to the kerbside as possible;

e) The receptacle is placed so that it does not disrupt or obstruct pedestrian, wheelchair or vehicular traffic, and so that access to the premises is preserved; and

f) The receptacle is placed for the collection of waste and is retrieved in accordance with any applicable control specified by the Council under this Bylaw.

8.4 No person shall deposit waste in a manner where:

a) The receptacle is damaged or otherwise likely to cause injury to the collector;

b) In the opinion of the Council, or the waste collector or waste operator where applicable, the waste is in an unsanitary or in an offensive condition;

c) The waste includes waste prohibited under this Bylaw;

d) The container/receptacle is not an approved receptacle;

e) The receptacle is in a condition that allows spillage of waste or is not of a sufficient size to contain the waste;

f) The receptacle or the waste does not comply with the rules under this Bylaw in terms of type, size, volume, weight, numbers, colour, placement or any other detail;

g) The number of approved receptacles placed out for collection is greater than the authorised number of receptacles for the property, unless approved by an authorised officer; or

h) Any other reason which the Council, or the waste collector or operator, deems would cause a health and safety concern to the waste collection operation.

8.5 No person shall:

a) Put waste into an approved receptacle allocated to any other person, without that other person's consent;

b) Remove waste from, or interfere with any waste deposited in, an approved receptacle, except the Council, a waste

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		collector, or the person who deposited the waste; or c) Remove a receptacle provided to the premises to which it has been allocated, except with the prior written approval of the Council or the waste collector. 8.6 The occupier and/or the manager of any premises is responsible for any waste generated on that premises until it has been collected. 8.7 The occupier and/or the manager of any premises is responsible for any waste not collected because of non-compliance with this Bylaw. Any waste or recyclables not collected shall be removed from the roadside by the occupier and returned to the occupier's premises by noon on the day following collection or within such other time period as specified by a control made under this Bylaw. 8.8 To enable the occupier and/or the manager of a premises to be able to comply with clauses 8.1-8.5, an authorised officer may approve placement of approved receptacles in a location other than directly outside that premises 8.9 Where any breaches of the conditions in clauses 8.1-8.5 occur, the waste collector shall not be obligated to collect the waste. 8.10 No waste shall be transported by vehicle through, over or upon any road or public place unless such waste is sufficiently and adequately covered to prevent any of the waste from falling or otherwise escaping on to any road or other public place. 8.11 Any waste or diverted material deposited in or on a public place or disposed of in a manner that is in breach of this Bylaw, and/or any controls made under clause 7 of the Bylaw, shall be deemed to be litter under the Litter Act 1979 and will be subject to enforcement action under that Act.
9	**Waste Collections from a Public Place**	9.1 Waste must not be placed on or in a public place for collection unless it is: a) A type of waste specified and approved by the Council as able to be placed on or in a public place for collection; and b) Placed in an approved receptacle for collection by a waste collector 9.2 Prohibited waste, diverted material, construction and demolition waste, or commercial or industrial waste must not be placed on or

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		in a public place for collection unless authorised by the Council under this Bylaw or another Council Bylaw. 9.3 Any waste collector who collects or transports waste from a public place must: a) Make available to the occupier and/or manager of a premises the appropriate approved receptacles to enable separate collection of each of the waste types required to be separately collected from the premises; b) Clearly identify their name and contact details on all approved receptacles; c) Not collect any household waste which has not been separated into the waste types as required under this Bylaw and/or any controls made under clause 7 this Bylaw; and d) Following collection, ensure that any receptacle is placed so that it does not disrupt or obstruct pedestrian, wheelchair or vehicular traffic, and so that access to the premises is preserved. 9.4 Any person providing or using a waste collection service in or from a public place must comply with all controls made under this Bylaw by the Council relating to that collection.
10	**Approved Collection Points**	10.1 No person may deposit waste at an approved collection point other than in accordance with any applicable Council control. 10.2 The Council may specify: e) Any place, or receptacle in a public place or on a barge in a marine area, as an approved collection point for the collection of household waste; and f) Controls relating to the deposit of waste at the collection point including the use of specified receptacles.
11	**Licensing of Waste Collectors and Waste Operators**	11.1 Any: a) Waste collector who handles more than 20 tonnes of waste in any one twelve month period in, around or out of Lower

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Hutt City or

b) Waste operator with a waste management facility in the Lower Hutt City that handles more than 20 tonnes of waste in any one twelve month period;

Must have a current licence that has been issued by the Council and may not collect waste or operate a waste management facility (as the case may be) without such a licence.

11.2 An application for a licence must be made on the approved form available from the Council, and must be accompanied by the application fee and the supporting information required by the Council to process the application.

11.3 The holder of an existing licence may apply to the Council for a renewal of that licence.

11.4 A licence is personal to the holder and is not transferable.

11.5 A licence may be granted or refused at the discretion of the Council, and if granted, may be on such terms and conditions as the Council considers fit.

11.6 When considering a licence application, the Council may take into account a range of factors including but not limited to the following:

a) The nature of the activity for which a licence is sought;

b) The extent to which the licensed activities will promote public health and safety, and support achievement of the Council's WMMP, including the waste minimisation goals and initiatives within that plan;

c) The extent to which the licensed activities will adopt best practice waste management and minimisation;

d) The quantity and type of waste to be handled;

e) The methods employed for the handling, disposing and recycling of the waste and the minimisation of litter, including (but not limited to):

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i) the identity of the waste management facility at which it is proposed that recycling, recovery, sorting, storage, treatment, or disposal will occur; and

ii) adherence to health and safety standards and any other relevant industry standards;

f) The frequency and location of the waste collection, removal, storage and transportation services;

g) The applicant's experience, reputation, and track record in the waste and diverted material industry, including any known past operational issues which may affect the applicant's performance, and any breaches of previous licence conditions; and

h) The terms and conditions under which any disposal of waste is permitted and the existence of, or need for, any statutory approvals, authorisations, or consents required to be held or complied with in respect of such disposal.

11.7 When considering an application for a licence, the Council may inspect the premises or locations related to the application in relation to the purposes for which the licence is sought.

11.8 A licensed waste collector or waste operator must comply with all terms and conditions of the licence. The terms and conditions may include, but are not limited to, the following matters:

a) Term – a licence may be granted for a term of up to five years from the date of Council approval, or for a shorter duration if specified in the terms and conditions of the licence, and will be reviewed every year by the Council to ensure compliance with the terms and conditions of the licence;

b) Licence fee – the licensee must pay an annual licence fee in the amount determined by the Council;

c) Performance bond – the Council may require a licence holder to post a bank-guaranteed bond or a security; A licence is personal to the holder and is not transferable.

d) Compliance – the licence holder must comply with any relevant controls, standards or policies the Council has set for waste handling such as (but not limited to):

i) Provision of waste collection services within reasonable collection times and to meet any minimum collection

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		frequencies specified by Council; ii) Provision of appropriate approved receptacles for waste collection which clearly identify the waste collector's name and contact details; and iii) The collection of any litter within a specified distance of an approved receptacle awaiting collection and any litter spillage from the licence holder's vehicle during the collection, transportation, storage or disposal process. e) Provision of information – the licence holder must provide data relating to all waste they have handled to the Council during the term of their licence, in the form and at the times determined by the Council (but not limited to): i) The quantities of various waste types that have been handled by the waste collector or waste operator during a specified period of time, including the source and destination of each waste type and the method of processing (recycling, recovery, treatment, disposal etc); and ii) Weighbridge receipts, gate records of waste tonnages per waste type as specified in the licence. 11.9 The Council may suspend or revoke a licence if the licence holder fails to comply with this Bylaw, any of the terms or conditions of the licence, any relevant controls made under this Bylaw, or acts in a manner which the Council considers, on reasonable grounds and in light of the purpose of this Bylaw, is not suitable for the holder of a licence. 11.10 Fees and charges for the issue of licences under this Bylaw are set out in Council's Schedule of Fees and Charges and may be amended from time to time in accordance with section 150 of the Local Government Act 2002.
12	**Multi-Unit Developments**	12.1 The owner and/or the manager of a multi-unit development must make adequate provision for the management of all waste, recycling and organic material generated within the premises. This includes arrangements for the regular collection of waste to the satisfaction of Council and the provision of adequate areas for:

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(a) The storage of disposed of or discarded material on the premises from any activity on that premises; and

(b) The collection of disposed of or discarded material if collection occurs on the premises.

Waste Management and Minimisation Plans

12.2 Subject to any exemption granted in accordance with clause 12.5, the owner and/or the manager of a multi-unit development must submit to the Council for approval a multi-unit development waste management and minimisation plan for:

a) The management of an existing multi-unit development if any of the occupiers cannot dispose of or discard material as expressly allowed in clause 8, within three months of the date that the owner and/or manager is notified by the Council of the requirement to obtain approval of a multi-unit development waste management and minimisation plan; or

b) A planned multi-unit development, prior to the commencement of construction of the multi-unit development.

12.3 A multi-unit development waste management and minimisation plan must include, but is not limited to, the following information:

a) The person or persons responsible for the management, collection and disposal of waste and the methods to be used;

b) Identification of an adequate area on the premises for the storage of receptacles that is readily accessible to the occupiers of units and the waste collector to enable separate collection and transportation of waste and recycling as specified by the Council;

c) An estimate of the types and volumes of waste that will be generated;

d) How waste generated within the premises is to be minimised employing the waste hierarchy, and the steps to maximise the collection and use of recyclables, organic waste and reusable material'

e) The methods to be used to minimise noise and odour and to keep the area hygienic, free from vermin or other infestations, and protected from theft and vandalism;

f) Identification of the means and route of access and egress to the waste storage area; and

g) Any other matter relating to waste management and minimisation that may be specified by the Council.

12.4 Any person who owns, manages or occupies a multi-unit development must comply with the approved multi-unit development waste management and minimisation plan for that development and any conditions applied to the approval by the Council (except

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	Waste Collection, Transportation, Storage and Deposit Controls	if an exemption is granted in accordance with clause 12.5). 12.5 The Council may, on application, grant a written exemption from compliance with all or any the requirements of this clause 12 if: a) In the opinion of the Council, the costs of full compliance would be disproportionate to any resulting waste management and minimisation benefits; and/or b) The owner and/or the manager demonstrates to the satisfaction of the Council that recyclable material, organic waste and other wastes are separately and regularly collected. 12.6 The Council may specify controls for the following matters in relation to the collection, transportation, storage or deposit of waste from multi-unit developments: a) The categories of recyclable material, organic waste and other residual waste that may be deposited at or collected from a multi-unit development; b) The times, locations and conditions applicable to any collection service from a multi-unit development, including the placement and retrieval of receptacles for collection, collection times and restrictions on the number and weight of approved receptacles; c) Requirements to ensure the correct separation of organic waste, recyclable materials and other residual waste into approved receptacles; and d) Any other operational matter required for the safe and efficient operation of a collection service from a multi-unit development. 12.7 Any person who owns or manages a multi-unit development or owns or occupies a unit in a multi-unit development must comply with any controls for the deposit, collection, transportation, storage and management of waste in the multi-unit development made by the Council under clause 7 of this Bylaw.

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13	**Events**	13.1 At least 30 working days prior to the commencement of an event, the event manager must submit to the Council for approval an event waste minimisation plan for the event. 13.2 The event waste minimisation plan must set out: a) An estimate of the types and amounts of waste to be generated by the event; b) How waste generated by the event is to be minimised; c) The steps that will be taken to maximise the use of reusable systems, the collection and use of recyclables and other recoverable, and compostable materials, and an estimate of the diversion of waste and the avoidance of waste; d) The equipment to be provided for any reusable system, and for the storage, collection and transportation of waste and diverted material; e) The proposed method for minimising and capturing litter associated with the event; f) The person responsible for the collection and disposal of waste and the methods to be used; g) The timing and frequency of the collection of waste, during or after the event; and h) Any other matters relating to event waste management and minimisation that may be specified by the Council. 13.3 The manager of an event must comply with the event waste minimisation plan approved by the Council for the event. 13.4 On completion of the event, the event manager must provide the Council with a waste analysis report, which at a minimum, will include a breakdown of: a) The types of waste generated by the event; b) The amounts of waste (by type) generated by the event; c) The amount of waste diverted and avoided; and

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		d) The waste management facilities used to recover, recycle, treat or dispose of this waste.
14	**Construction Site and Demolition Waste**	14.1 The Council may make a control under this Bylaw to require any person that is applying for a building consent for building work of a certain estimated value or higher to submit a construction site and demolition waste management plan to the Council for approval prior to the commencement of any building work. 14.2 At a minimum, a construction site and demolition waste management plan must set out: a) The name of the client, principal contractor, and person who prepared the waste management plan; b) The location of the site; c) The estimated total cost of the building work; d) A description of all types of waste expected to be produced; e) The proposed method of waste management for each type of waste (e.g. reuse, recovery, recycling, disposal); and f) The proposed method for minimising and capturing litter associated with the project and the building work. 14.3 A construction site and demolition waste management plan is required by Council to set out: a) An estimate of the quantity of each type of waste; and b) An estimate of the diversion of waste. 14.4 While the building work is being carried out, the principal contractor must : a) Review the construction site and demolition waste management plan as necessary; b) Record quantities and types of waste produced; and

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		c) Record the types and quantities of waste that have been: i) Reused (on or off site); ii) Recycled (on or off site); iii) Sent to other forms of recovery (on or off site); iv) Sent to landfill; v) Sent to cleanfill; or vi) Otherwise disposed of. 14.5 Within three months of completion of the building work the principal contractor must to add to the construction site and demolition waste management plan: a) Confirmation that the plan has been monitored and updated; b) A comparison of estimated quantities of each type of waste generated against the actual quantities of each waste type; c) An explanation of any deviation from the plan; and d) An estimate of any cost savings that have been achieved by completing and implementing the plan. 14.6 Where a construction site and demolition waste management plan is required, the principal contractor must ensure that a copy of the construction site and demolition waste management plan is kept on site, and that every contractor knows where it can be found. It must be available to any contractor carrying out any work described in the plan.
15	**Inorganic Waste**	15.1 The Council may specify controls for the following matters in relation to the collection of inorganic waste from a public place: a) The weight, size and nature of inorganic waste that may be deposited for collection;

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		b) The categories of inorganic waste that may be deposited for collection; c) The times, locations and conditions applicable to the collection of inorganic waste from a public place; d) The collection methods that cause health and safety risks; e) Any other operational matters required for the safe and efficient collection of inorganic waste from a public place. 15.2 Any person who deposits inorganic waste for collection on, or collects and transports inorganic waste from, a public place must comply with any controls made by the Council under this Bylaw.
16	**Nuisance and Litter**	16.1 No person may: a) Allow any accumulation of waste or diverted material on any premises they own, occupy or manage to become offensive, a nuisance or likely to be injurious to health; or b) Use an approved receptacle in a manner that creates a nuisance, is offensive or is likely to be injurious to health. 16.2 Except as provided for under this Bylaw, no person may: a) Bury or allow to be buried any waste on any property they own, occupy or manage except: i) Organic waste, including dead farm animals in rural areas; ii) Dead companion animals and nuisance pests; or iii) For the purposes of home composting; iv) Waste deposited in a farm refuse dump or an offal pit that is consented or complies with the permitted activity conditions of the Wellington Region Natural Resources Plan; b) Dispose of any waste on any premises except at –

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		i) a waste management facility, or ii) any premises they own, occupy or manage, for the purposes of home composting. 16.3 No person may: a) Deposit any waste arising from that person's household or that person's business activities in any litter receptacle provided by the Council in any public place; b) Remove any waste from any litter receptacle provided by the Council in any public place, where this results in any waste being deposited outside the litter receptacle, unless authorised by the Council to do so; c) Deposit or attempt to deposit any litter in any litter receptacle provided by the Council in any public place if: i) the receptacle is full; or ii) the litter is likely to escape; d) Fix or attach any flag, banner, bunting, balloon, sign, poster, leaflet or similar thing to any litter receptacle provided by the Council in any public place; or e) Damage any litter receptacle provided by the Council in any public place. 16.4 The owner, occupier or manager of any premises on which any flag, banner, bunting, balloon, sign, poster, leaflet or similar device is displayed that is likely to become litter, must take all steps to the satisfaction of the Council to prevent it becoming litter and to clean it up in the event that it does become litter.
17	**Unaddressed mail and advertising material**	17.1 No person may deposit, cause, permit or authorise the deposit of any unaddressed mail or advertising material: a) In any letterbox which is clearly marked "no circulars", "no junk mail", "addressed mail only" or with words of similar effect, or around or near any such letterbox or associated vehicle accessway; b) On any vehicle parked in a public place; or

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		c) In a letterbox that is already full of mail and/or advertising materials. 17.2 Clause 17.1 (a) does not apply to: a) Material or public notices from any government department or agency, crown entity, local authority, or material from a network utility relating to the maintenance, repair, servicing or administration of that network utility; b) Communications or fund raising material from local community organisations, charities or charitable institutions; c) Material from a political party, political candidate or elected member; or d) A community newspaper or newsletter, unless the letterbox is clearly marked "no community newspapers" or with words of similar effect. 17.3 Any unaddressed mail or advertising mail deposited in a manner in breach of clauses 17.1 and 17.2 shall be deemed to be litter under the Litter Act 1979.
18	**Donation Collection Points**	18.1 Anyone intending to establish a donation collection point in or on a public place must notify the Council in advance and must operate the donation collection point in compliance with any requirements the Council specifies including but not limited to: a) Location; b) Vehicle access c) Type of waste which may be deposited; and d) Use of approved receptacles 18.2 All donation collection points must ensure: a) The removal of deposited material from the collection point;

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		b) The clean-up of any litter or illegal dumping; and c) The clean-up or removal of any graffiti.
PART C: OTHER MATTERS		
19	**General Offences and Penalties**	19.1 Any person who fails to comply with this Bylaw and the decisions and controls made under this Bylaw commits an offence under section 239 of the Local Government Act 2002 and is liable to a fine as specified in section 242(4) of the Local Government Act 2002. 19.2 A person who commits a breach of this Bylaw that is an offence under the Litter Act 1979, the Waste Minimisation Act 2008 or the Health Act 1956 is liable to a penalty (without limitation) under those Acts, as relevant.
20	**Other Enforcement Powers –** **Non-compliance with Licence Terms and Conditions**	20.1 Any control that is made or amended by Council under clause 7.1 shall be enforceable under this Bylaw. 20.2 Where a licence holder does not comply with the requirements of this Bylaw and/or the terms and conditions of a licence, the Council may take one or more of the following steps: a) Issue a written warning to the licence holder, which may be treated as evidence of a prior breach of a licence condition during any subsequent review of the licence; b) Review the licence, which may result in: i) Amendment of the licence; or ii) Suspension of the licence; or iii) Withdrawal of the licence. c) Have recourse to any performance bond or security where the Council has incurred any cost as a result of the breach of

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	Non-compliance with General Responsibilities and Waste Collection Requirements	the licence condition, including where the Council has itself performed or arranged for the performance of any licensed activity on the default of the licence holder; d) Review the amount and nature of the performance bond or security, which may result in: i) An increase of the amount of the performance bond or security; ii) A change to the nature of the security that has been provided. e) Enforce any offence that may have been committed under the Litter Act 1979; and f) Enforce any breach of this Bylaw, as provided for in the Health Act 1956, the Local Government Act 2002 and the Waste Minimisation Act 2008. 20.3 Where a person does not comply with the requirements of this Bylaw and/or any controls made under the Bylaw in relation to the waste and diverted materials collection service that applies to them, the Council (or a licensed waste collector where applicable) may take the following action(s) against the person: a) Reject (i.e. not collect) the contents of any approved receptacle left out by that person for collection from a public place, if the contents or placement of the receptacle is non-compliant; b) Remove the contents of any approved receptacle left out for collection from a public place where the contents or placement of the receptacle is non-compliant, subject to payment of the costs of removal, administrative costs and an additional penalty equivalent to the amount payable for the collection of the largest available size of approved receptacle from that premises; c) Withdraw or suspend the collection service being provided to that person; d) Enforce any offence that may have been committed under the Litter Act 1979; and/or e) Enforce any breach of this Bylaw, as provided for in the Health Act 1956, the Local Government Act 2002 and the Waste Minimisation Act 2008.

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	Non-compliance with Approved Collection Points Requirements	20.4 Where action has been taken against a person under clause 20.3(c), the Council can authorise the reinstatement of the collection service once it is satisfied on reasonable grounds that the Bylaw will be complied with.
	Non-compliance with Waste Management Plan Requirements	20.5 Where a person does not comply with a control made by the Council under clause 12 of this Bylaw the Council may: a) Suspend that person's use of any service provided by the Council at any or every waste collection service; b) Enforce any offence that may have been committed under the Litter Act 1979; or c) Enforce any breach of this Bylaw, as provided for in the Health Act 1956, the Local Government Act 2002 and the Waste Minimisation Act 2008. 20.6 Where a person does not comply with any of the requirements in clauses 12 (Multi-Unit Developments), 13 (Events) or 14 (Construction Site and Demolition Waste Management Plans) and/or any controls made under the Bylaw, the Council may take one or more of the following steps: a) Enforce any offence that may have been committed under the Litter Act 1979; and/or b) Enforce any breach of this Bylaw, as provided for in the Health Act 1956, the Local Government Act 2002 and the Waste Minimisation Act 2008.
	Non-compliance with Inorganic Material Requirements	20.7 Where a person does not comply with a control made by the Council under clause 15 of this Bylaw, the Council (or a licensed waste collector or waste operator where applicable) may: a) Reject (i.e. not collect) the inorganic material, if the inorganic material or placement is non-compliant; b) Remove the inorganic material, where the inorganic material or placement is non-compliant, subject to payment of the costs of removal, administrative costs and an additional penalty specified by the council; c) Enforce any offence that may have been committed under the Litter Act 1979; and/or d) Enforce any breach of this bylaw, as provided for in the Health Act 1956, the Local Government Act 2002 and the Waste

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		Minimisation Act 2008.
	Non-compliance with Unaddressed Mail Requirements	20.8 Where a person does not comply with any of the requirements in clause 17 of this Bylaw, the Council may use its enforcement powers under the Litter Act 1979.
21	**Exceptions and Saving Provisions**	21.1 A person is not in breach of this Bylaw if that person proves that the act or omission was in compliance with the directions of an Authorised Officer. 21.2 A product stewardship scheme accredited under the Act may be exempt from the requirements of this Bylaw.
22	**Fees**	22.1 The Council may in accordance with the provisions of section 150 of the Local Government Act 2002 set prescribed fees under this Bylaw. 22.2 The Council may refund, remit or waive any fee prescribed by this Bylaw or charge payable for an authority, approval, licence, permit or consent from, or inspection by, the Council, for any reason it thinks fit.
23	**Forms and Processes**	23.1 The Council may prescribe the form of, and process to be followed for, any application, approval, licence, or other document, which is required under this Bylaw (or any related controls made by Council). These forms and processes may be altered or amended at any time.

NEW SCHEDULE 1

In accordance with clause 7.1 of the Hutt City Council Solid Waste Management and Minimisation Bylaw 2021, the Council resolves the following controls in relation to solid waste management, collection and disposal.

1. INTRODUCTION AND COMMENCEMENT

1.1. These are Council resolutions made pursuant to clause 7.1 of the Hutt City Council Solid Waste Management and Minimisation Bylaw 2021 ("the Bylaw") and should be read and conjunction with it.

1.2. These resolutions come into force on 10 August 2021, and replace the controls that came into force on 25 January 2021.

2. CONTROLS

2.1 **Collection of Domestic Refuse and Recyclable Material**

2.1.1 All domestic refuse and/or recyclable material to be collected by Council's collection service must be placed in the relevant approved receptacle for each waste stream.

2.1.2 The occupier of every residential dwelling unit who wishes to be served by a collection service conducted or controlled by the Council shall, on each collection day, and not later than 6am on that day, place their approved receptacles at the kerbside nearest the dwelling unit, or in any other position, such as share waste storage areas, determined by Council Officers.

2.1.3 Where as a result of circumstances beyond its control Council is unable to empty approved receptacles, and/or collect domestic refuse and/or recyclable material on the stipulated collection day, the occupier must remove the domestic refuse and/or recyclable material from the kerbside, by the end of the following day.

2.2 **Restrictions on Materials**

2.2.1 No person shall deposit or cause or allow any of the following materials to be deposited in any approved receptacle placed for collection.

a) Explosives, hot ashes, highly inflammable material or infectious material;

b) Liquids, acids, printer's ink, paint, or any other viscous fluid

c) Any trade waste, offal or large dead animals.

d) Any pesticides, herbicides, fungicides or other toxic compounds or any containers that have been used to hold such materials;

e) Any large batteries, such as car batteries

f) Any other prohibited waste as identified under the definition of "prohibited waste" in clause 6 of the Bylaw.

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3. ALTERNATE AGREEMENTS

3.1 The Council may enter into an agreement with the occupier of a dwelling unit, commercial building or part of a commercial building in respect of the collection of:

a) Domestic refuse upon a basis other than that determined under this bylaw; or

b) Trade refuse.

4. COLLECTION POINT(S)

4.1 The Council may:

a) Specify the location of collection point(s), at which recyclable materials will be received from the public;

b) Issue instructions for the use of collection points by members of the public.

4.2 No person shall leave or place domestic refuse or trade refuse at collection points.

5. WASTE SEPARATION

5.1 No waste, other than clean accepted recyclable materials, shall be deposited in any approved receptacle provided for recycling purposes.

a) Mixed recycling bin: Only the following clean materials shall be deposited in the approved recycling wheelie bin with the yellow-lid: Paper, cardboard (flattened), plastic containers #1, #2, and #5 (rinsed, lids removed, not squashed), metal tins and cans (rinsed, not squashed)

b) Glass crate: Only the following clean materials shall be deposited in the approved blue glass recycling crate: glass bottles and jars (rinsed, lids removed, not broken)

c) Green waste: Only the following plant materials shall be deposited in the approved green (garden) waste bin: plant cuttings, grass clippings, weeds, wood cuttings less than 20cm

5.3 Where there is a change to the types of recyclable materials accepted for collection from the kerbside or collection points, one or more of the following methods of notification may be used by Council to notify such change: flyers, newspaper advertisement, Council website or as indicated on signage at a collection point(s).

6. CONSTRUCTION SITE AND DEMOLITION WASTE MANAGEMENT PLAN

6.1 In accordance with clause 14 of the Hutt City Council Solid Waste Management and Minimisation Bylaw 2021, any person that is applying for a building consent for building work with an estimated value of $2million or higher must submit a construction site and demolition waste management plan to the Council for approval prior to the commencement of any building work.

6.2 Clause 14.1 of the Hutt City Council Solid Waste Management and Minimisation Bylaw 2021 will become effective on 25 January 2022.

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Appendix C - Hazardous Waste Disposal Guidelines

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Hutt City Council

Waste Disposal Guide
Hutt City Landfills

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1 Purpose of the guide

The purpose of this guide is to assist waste generators in the proper disposal of waste to HCC landfills. It provides guidance to waste generators on waste classifications (Section 2) and procedures for waste acceptance (Section 3). This document supersedes the May 1999 guide.

Generators of waste will either be disposing of the waste directly, or retaining a waste disposal company. All parties involved in waste disposal (generators, waste disposal contractors, and transporters) must be aware of the nature of the waste being disposed and be accountable for it.

1.1 Waste reduction

All wastes should be reduced, reused, or recycled if possible prior to disposal. A list of recycling companies known to HCC is attached as Appendix A. The list is not exhaustive. Further information on cleaner production is available from HCC on request.

1.2 HCC's Industrial Waste Policy

HCC will operate industrial waste facilities that enable sustainable and cost effective means of disposal for a wide range of industrial wastes.

HCC will encourage waste generators to implement the following waste management hierarchy to the greatest extent practical:

- reduce the amount and toxicity of material entering the waste stream;
- reuse materials;
- recycle the materials that cannot be reused; and
- recover resources from the waste stream.

HCC will continue to promote the introduction of cleaner production practices.

Charges for the disposal of industrial wastes will be set to recover the full cost of disposal including the long-term management risks.

Policies will be consistent with the Resource Management Act and in particular the sustainable management of natural and physical resources.

1.3 Authorisation

This guide has been authorised for Hutt City Council by:

.....

Bruce Sherlock

General Manager Infrastructure

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2 Waste classification

Waste is categorised as **General Waste, Listed Special Waste, Special/Hazardous Waste, or Prohibited Waste.** Definitions and examples of each type are provided below.

2.1 General Waste

General Waste is material that poses no extra risk to landfill staff or the environment. It typically comprises solid waste generated by domestic premises (e.g., households, hotels and other housing establishments) and commercial waste that is not classified as Special Waste. General Waste includes:

- Home-use chemicals, such as:
  - Solvent-based adhesives and sealants, non-aqueous based paints, paint thinners, household cleaners, up to 2 litres or 2 kg per load
  - Water based paint, up to 10 litres per load
  - Associated waste items such as rags, used brushes and empty containers
- Dry cell, "button", rechargeable and lithium batteries; in reasonable household quantities.
- Smoke alarms
- Pharmaceutical wastes - up to 1 litre or 1 kg per load
- Medical waste, complying with the general waste category of NZS 4304:1990
- Business office wastes
- Construction and demolition debris
- Wire rope and steel formed sections that are cut into lengths of 1 metre maximum
- Empty containers, excluding containers of hazardous substances. Containers larger than 20 litres must be crushed prior to disposal

The following wastes are **not** acceptable as General Waste:

- **Lead-acid batteries.** A recycling facility is available within the landfill
- **Pool chemicals.** Empty and washed out containers are acceptable
- **Pesticides.** Greater than 1 kg. Empty household size pesticide containers are acceptable.
- **Lubricating and other oils.** A recycling facility is available at the landfill

2.2 Listed Special Wastes

Listed Special Wastes are generally non-hazardous but require immediate burial, and include:

- Asbestos waste, including building demolition, maintenance or cleaning, wallboard, roofing, wall and ceiling spray coverings and pipe insulation. The asbestos must be thoroughly wetted (or modified by a bonding agent or coating) and packaged in accordance with the Health and Safety in Employment (Asbestos) Regulations 1998.
- Commercial products or chemicals and their containers that are off-specification, outdated or unusable, provided they are visually identifiable and non-hazardous.
- Empty containers that once held hazardous substances. Containers must be empty according to label directions, triple rinsed with an appropriate solvent or cleaned by an equivalent method and rendered unusable. All drums must be crushed prior to disposal.
- Commercial wastes from non-manufacturing, retail and wholesale businesses, warehousing, service and transportation activities.

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- Industrial and manufacturing non-hazardous wastes.
- Wire rope and steel formed sections longer than 1 metre.
- Bulky industrial and commercial items such as large construction materials or components.
- Commercially sensitive non-hazardous materials that require witnessed burials (e.g. police files and confidential records).
- Aesthetically disturbing materials such as dead animals.
- Dust, including cereal dusts, carpet and wool dusts and carbon black/soot.
- Odorous non-hazardous waste.
- Sludges with no free liquid present, greater than 20% solid content, a slump of less than 200mm, arising from:
  - Septic tanks, food service grease traps, Laundromats and car washes.
  - Water treatment plants
  - Sewage treatment plants (Silverstream Landfill only).
- Silverstream Landfill only: sewage treatment plant milliscreenings.

2.3 Special/Hazardous Wastes

Special/Hazardous Wastes are those requiring special handling, burial, and pre-treatment or testing before they can be accepted for landfill disposal. Special/Hazardous Waste is waste that cannot be visually identified or verified as non-hazardous, including:

- Offal. Chicken, fish, paunching and abattoir wastes, fleshings, and fellmongery wastes that have been rejected by the usual processor.
- Infectious wastes that comply with NZS 4304:2002, including hospital, medical clinic, nursing home, medical practitioner, mortuary, veterinary hospital or animal testing laboratory. Infectious wastes have the following restrictions:
  - Infectious waste must be autoclaved or otherwise sterilised so that it is no longer capable of inducing infection. Laboratory pathogenic organism cultures that have not been sterilised are prohibited.
  - Human body parts, except minor tissue samples are prohibited.
  - All “sharps”, (needles and cutting implements) must be rendered harmless or placed in puncture proof containers.
- Waste produced from the demolition or dismantling of industrial process equipment or facilities contaminated with chemicals from an industrial process.
- Agricultural and biological wastes - provided they have no free liquid, and are solidified to more than 20% solids, less than 200mm slump.
- Waste types listed in Table YA, wastes having constituents listed in Table YB, or waste exhibiting the hazardous characteristics described in Table H (see Appendix C).

2.4 Prohibited Wastes

Prohibited wastes cannot be accepted for disposal because they pose an unacceptable risk to landfill staff or the environment.

Wastes exhibiting any of the following characteristics will not be accepted:

- Explosives
- Flammable liquids

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- Flammable solids
- Substances or wastes liable to spontaneous combustion
- Substances or wastes which, in contact with water, emit flammable gases
- Oxidising substances
- Organic peroxides
- Infectious substances
- Radioactive material
- Corrosives
- Substances that liberate toxic gases in contact with air or water
- Capable, by any means, after disposal, of yielding another material, e.g., leachate, which possesses any of the characteristics listed above.

The following specific waste types and waste components are prohibited:

- Waste substances or articles containing or contaminated with polychlorinated biphenyls (PCBs) and/or polychlorinated terphenyls (PCTs) and/or polybrominated biphenyls (PBBs).
- Waste chemical substances, arising from research and development or teaching activities, which are not identified and/or are new and whose effects on human health or the environment are not known.
- Explosive wastes.
- Halogenated organic solvents.
- Polychlorinated dibenzofuran or polychlorinated dibenzo-p-dioxin (any congener or mixture of congeners)

The following categories of wastes, which may or may not be hazardous, are also prohibited, as they do not conform to the requirements of the landfill operating practices.

- Bulk liquids (more than 20 litres).
- Sludges with free liquid present, less than 20% solids, and a slump of greater than 200 mm.
- Sealed drums/containers.
- Electrical fittings that contain PCBs. Electrical fittings that are likely to contain PCB must be disposed of through authorised contractors, not to landfill. Fittings likely to contain PCB are:
  - Resonant start.
  - Dated from 1950 to 1970.
  - Have a capacitor that is round, oval or rectangular, within an aluminium container with a weld running around the top edge and two terminals with quick release tags.
  - Have a capacitor within a rectangular tin container with soldered seams or slightly heavier capacitor than post 1970s types.

  All electrical waste of a type that could contain PCB needs to have a “PCB Free Certificate” before it can be disposed of at HCC landfills.

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3 Waste acceptance

3.1 Acceptance locations

Wainuiomata Landfill accepts General Waste and Listed Special Waste only.

Silverstream Landfill accepts General Waste, Listed Special Waste, and Special/Hazardous waste.

Prohibited wastes will not be accepted at either of the HCC landfills.

3.2 Acceptance procedure

3.2.1 General Waste

No documentation or prior notification is required.

3.2.2 Listed Special Waste

Listed Special Wastes will be accepted upon completion of a "Listed Special Waste Disposal Declaration" form (Appendix B).

The Landfill Operator must be notified at least **24 hours** before disposing of Listed Special Wastes.

Notice shall include a description of the waste and details of the transporter delivering the waste. A fax of the completed declaration form would be appropriate.

A copy of the declaration must be passed to the kiosk attendant at the landfill, at the time of disposal of the load.

3.2.3 Special/Hazardous Waste

The waste generator must complete an "Application for Disposal of Special/Hazardous Waste" (Appendix C). The Generator shall give at least **3 working days** notice to HCC for approval to dispose of Special/Hazardous waste.

HCC will decide whether to accept the waste, based on the composition, physical or chemical properties and regulatory status. HCC may require additional information, such as laboratory analysis results, before making a decision.

If HCC accepts the waste for disposal, a "Waste Acceptance Form" will be issued. A copy of this form must accompany each load of waste delivered to the landfill.

The generator or transporter shall give not less than 1 working days notice to the Landfill Operator prior to the delivery of Special/Hazardous waste to the landfill.

Visual checking, random sampling and analysis of wastes on delivery may be carried out to confirm the waste conforms to the description given on the "Application for Disposal of Special/Hazardous Waste" form.

Any person or organisation who makes false declarations relating to the type of waste being disposed may be refused future entry to the landfill.

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Appendix A: Recycling companies

Material	Company name, location	Contact number
Building materials	Action Building Recyclers, Lower Hutt	s7(2)(a) [redacted]
	Home Improvers Building Recyclers, Lower Hutt	
	Ironman Building Recyclers, Upper Hutt	
	James Henry Joinery, Upper Hutt	
	No Name Building Recycling, Ngauranga	
	Renovators, Petone	
	Seaview Transfer Station, Seaview	
Car batteries	Ingot Scrap Metals, Seaview	
	Seaview Transfer Station, Seaview	
	Sims Pacific Metals, Seaview	
Paper, cardboard	DOSS Ltd, Seaview	
	Full Circle Recycling	
	Paper Chain, Seaview	
	Seaview Transfer Station, Seaview	
	Transpacific Allbrite Ltd	
Plastics	Pacific Plastics, Otaki	
	Seaview Transfer Station, Seaview	
	Transpacific Allbrite Ltd	
Scrap metals	AKB Ingot Metals, Seaview	
	Capital Recycling Centre, Seaview	
	General Metal Recyclers, Lower Hutt	
	Ingot Scrap Metals, Seaview	
	Macaulay Metals, Petone	
	Parts Export 2008 Ltd, Petone	
	Seaview Transfer Station, Seaview	
	Sims Pacific Metals, Seaview	
	Transpacific Allbrite Ltd	
	Upper Hutt Metals Ltd, Upper Hutt	
Solvents and hazardous waste	Transpacific Technical Services, Seaview	
Used oil	Seaview Transfer Station, Seaview	
	Thurline Transport Services, Seaview	

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HUTT CITY COUNCIL
SILVERSTREAM LANDFILL
LISTED SPECIAL WASTE DISPOSAL DECLARATION

IMPORTANT INFORMATION

1. Complete this Disposal Declaration in full.
2. 24 hours' prior notification is required for landfill disposal of Listed Special Wastes. Please telephone the Landfill Manager on (04) 563-6952.
3. The completed Disposal Declaration must be given to the kiosk attendant on arrival at the landfill.
4. Random sampling and analysis of wastes will be carried out to ensure compliance with the Disposal Declaration.

Waste Generator to complete:

Waste Generator Name: _____

Waste Type: _____

Approx. Quantity: _____

I declare that the contents of this load to be disposed are listed special wastes

Signature: _____ Date: _____

Transporter to complete:

Transport Company: _____ Vehicle No.: _____

Driver's Signature: _____ Date: _____

Landfill Staff to complete:

Kiosk operator signature: _____ Date: _____

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PRIVACY ACT STATEMENT

I/We acknowledge that:

1. Personal information concerning me/us provided to Hutt City Council ("the Council"), whether contained in this application or otherwise obtained is provided and may be held, used and disclosed by the Council:

   (a) to enable the Council to communicate with me/us for any purpose;

   (b) to enable the Council to provide me/us, or have provided to me/us, advice and information concerning products and services that the Council believes may be of interest to me/us;

   (c) to enable the Council to administer and maintain its records and carry out its required functions.

2. The personal information provided in this application is collected by and will be held by the Council, whose address is Private Bag 31912, 30 Laings Road, Lower Hutt.

3. If I/we fail to provide any of the information the Council may be unable to process the application.

4. I/we have the right under the Privacy Act 1993 to obtain access to and to request correction of any personal information held by the Council concerning me/us.

Council has a Privacy Officer. If you have any concerns regarding privacy issues please telephone 570-6736.

_____

(Please sign)

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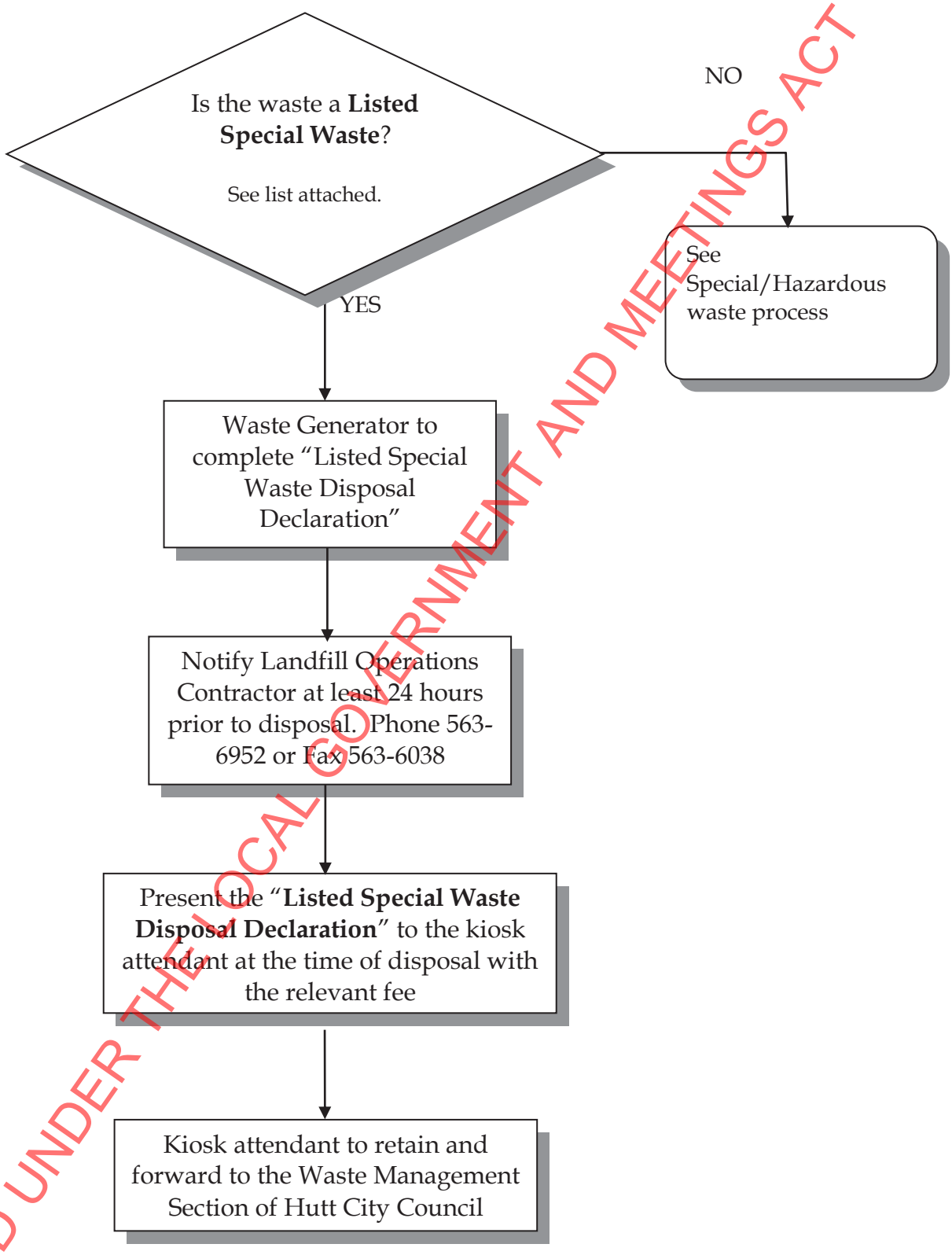
Listed Special Wastes Acceptance process



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NOTES ON LISTED SPECIAL WASTE

Special wastes require special handling, burial, pre-treatment or testing before they can be accepted for landfill disposal.

Listed Special Wastes are generally non-hazardous but require immediate burial, and can be visually verified as non-hazardous and/or suitable for landfill disposal. Listed Special Waste will be accepted upon completion of a "*Listed Special Waste Disposal Declaration*".

Listed Special Wastes include:

- Asbestos waste, including building demolition, maintenance or cleaning, wallboard, roofing, wall and ceiling spray coverings and pipe insulation. The asbestos must be thoroughly wetted (or modified by a bonding agent or coating) and packaged in accordance with the Health and Safety in Employment (Asbestos) Regulations 1998.
- Commercial products or chemicals and their containers that are off-specification, outdated or unusable, provided they are visually identifiable and non-hazardous.
- Empty containers that once held hazardous substances. Containers must be empty according to label directions, triple rinsed with an appropriate solvent or cleaned by an equivalent method and rendered unusable. All drums must be crushed prior to disposal.
- Commercial wastes from non-manufacturing, retail and wholesale businesses, warehousing, service and transportation activities.
- Industrial and manufacturing non-hazardous wastes.
- Wire rope and steel formed sections longer than 1 metre.
- Bulky industrial and commercial items such as large construction materials or components.
- Commercially sensitive non-hazardous materials that require witnessed burials (e.g. police files and confidential records).
- Aesthetically disturbing materials such as dead animals.
- Dust, including cereal dusts, carpet and wool dusts and carbon black/soot.
- Odorous non-hazardous waste.
- Sludges with no free liquid present, greater than 20% solid content, a slump of less than 200mm, arising from:
    - Septic tanks, food service grease traps, Laundromats and car washes.
    - Water treatment plants
    - Sewage treatment plants (Silverstream Landfill only).

NOTE: Special wastes that **cannot** be visually identified or verified as non-hazardous wastes will be treated as hazardous wastes and an "*Application for Disposal of Special/Hazardous Waste*" form must be completed before these wastes are accepted for disposal. Such wastes will frequently require pre-acceptance testing for chemical composition to determine whether they are within the acceptance criteria for hazardous waste outlined in this guide

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HUTT CITY COUNCIL

SILVERSTREAM LANDFILL
APPLICATION FOR DISPOSAL OF SPECIAL/HAZARDOUS WASTE

Conditions for the Acceptance of Special/Hazardous Wastes at Silverstream Landfill

1. This form is for wastes having characteristics as described in Table H; or of a waste type listed in Table YA; or containing constituents listed in Table YB (tables attached).
2. Customer / Generator to complete this application as fully as possible and send to the HCC Solid Waste Consultant Tonkin & Taylor (T&T) on fax (04) 381-2908 or email well@tonkin.co.nz. For any queries please phone (04) 381-8560.
3. T&T will determine the acceptability of the waste or adequacy of the information provided. T&T will advise the customer/generator if additional analytical testing or other data are needed.
4. T&T will send notification of approval. A copy of the approval must accompany each load to the landfill.
5. After approval, contact Silverstream Landfill Manager (04) 563-6952, giving 24 hours notice of proposed delivery. Loads will only be accepted dependent on weather conditions.
6. Random sampling and analysis of wastes may be carried out to ensure compliance with the HCC Landfill Waste Disposal Guide.
7. Should a generator, waste disposal contractor or transporter fail to comply with this notice then special/hazardous wastes may no longer be accepted for disposal from that person or company.
8. Any person discharging or depositing undeclared hazardous waste into or onto a landfill may be prosecuted.

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HUTT CITY COUNCIL: APPLICATION FOR DISPOSAL OF SPECIAL/HAZARDOUS WASTE

1 Generator information **Application No:**

1.1 Generator's Name: _____ 1.4 Phone: _____

1.2 Contact Person: _____ 1.5 After-hours: _____

1.3 Business Address: _____ 1.6 Fax: _____

2 Waste Information

2.1 Description of the waste: _____

2.2 Location where waste generated: _____

2.3 Current storage location: _____

2.4 Process involved in generating the waste: _____

2.5 Batch number/date waste generated: _____

2.6 Is this waste treated hazardous waste? YES/NO

If yes, describe the treatment: _____

2.7 Safety and handling instructions: _____

2.8 Estimated quantity (litres or kg): _____

2.9 Packaging method:

3 Waste Characteristics

3.1 Physical characteristics of the waste (e.g. solid, powder, sludge, etc.): _____

3.2 Is the waste odorous? YES/NO

3.3 Does the waste exhibit any of the characteristics listed in attached Table H? YES/NO

If YES, specify which ones: _____

3.4 Is the waste type listed in attached Table YA? YES/NO

If YES, specify which type: _____

3.5 Does the waste contain any of the constituents listed in attached Table YB? YES/NO

If YES, specify which ones: _____

What are the concentrations of these constituents (e.g., %, mg/kg)? (attach supporting documents such as analytical certificates, TCLP results, MSDS, etc)

4 Certification

I hereby certify that the above and attached description is complete and accurate to the best of my knowledge. No deliberate or wilful omissions of waste composition, properties or quantities exist and all known or suspected hazards have been disclosed.

Signature: _____ Date: _____

Name: _____ Position: _____

Please fax or email completed form to Tonkin & Taylor: (04) 381-2908 or well@tonkin.co.nz

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TABLE H: LIST OF HAZARDOUS CHARACTERISTICS

UN Class*	Code	Characteristics
1	H1	Explosives An explosive substance or waste is a solid or liquid substance or waste (or mixture of substances or wastes) which is in itself capable by chemical reaction of producing gas at such a temperature and pressure and at such a speed as to cause damage to the surroundings.
3	H3	Flammable Liquids The word "flammable" has the same meaning as "inflammable". Flammable liquids are liquids, or mixtures of liquids, or liquids containing solids in solution or suspension (for example, paints, varnishes, lacquers, etc, but not including substances or wastes otherwise classified on account of their dangerous characteristics) which give off a flammable vapour at temperatures of not more than 61 deg. C.
4.1	H4.1	Flammable Solids Solids, or waste solids, other than those classed as explosives, which under conditions encountered in transport are readily combustible, or may cause or contribute to fire through friction.
4.2	H4.2	Substances or Wastes Liable to Spontaneous Combustion Substances or wastes which are liable to spontaneous heating under normal conditions encountered in transport, or to heating up on contact with air, and being then liable to catch fire.
4.3	H4.3	Substances or Wastes which, in Contact with Water, Emit Flammable Gases
5.1	H5.1	Substances or wastes which, by interaction with water, are liable to become spontaneously flammable or to give off flammable gases in dangerous quantities.
5.1	H5.1	Oxidizing Substances Substances or wastes, which while in themselves not necessarily combustible, may, generally by yielding oxygen cause, or contribute to, the combustion of other materials.
5.2	H5.2	Organic Peroxides Organic substances or wastes which contain the bivalent-o-o-structure are thermally unstable substances which may undergo exothermic self-accelerating decomposition.
6.1	H6.1	Poisonous Substances Substances or wastes liable either to cause death or serious injury or to harm human health if swallowed or inhaled or by skin contact.
6.2	H6.2	Infectious Substances Substances or wastes containing viable micro organisms or their toxins which are known or suspected to cause disease in animals or humans.
7	H7	Radioactive Material Spontaneously emits radiation greater than background level. Includes alpha, beta, gamma, x-rays, neutrons, high energy electrons, protons, other atomic particles.
8	H8	Corrosives Substances or wastes which, by chemical action, will cause severe damage when in contact with living tissue, or, in the case of leakage, will materially damage, or even destroy, other goods or the means of transport; they may also cause other hazards.
9	H10	Liberation of Toxic Gases in Contact with Air or Water Substances or wastes which, by interaction with air or water, are liable to give off toxic gases in dangerous quantities.
9	H11	Toxic (Delayed or Chronic) Substances or wastes, which, if they are inhaled or ingested or if they penetrate the skin, may involve delayed or chronic effects, including carcinogenicity.
9	H12	Exotoxic Substances or wastes which if released, present or may present, immediate or delayed adverse impacts to the environment by means of bioaccumulation and/or toxic effects upon biotic systems.
9	H13	Capable, by any means, after disposal, of yielding another material, e.g., leachate, which possesses any of the characteristics listed above.

*Corresponds to the hazard classification system included in the United Nations Recommendations on the Transport of Dangerous Goods (ST/SG/AC.10/1/Rev.6, United Nations, New York, 1989)

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TABLE YA: HAZARDOUS WASTE TYPES

WASTE TYPES		LIKELY SOURCES
Y1	Clinical wastes	Hospitals, public and private, medical clinics, emergency clinics, day hospitals, veterinary clinics, medical schools, mortuaries
Y2	Pharmaceutical production	Manufacture and formulation of pharmaceutical products. Chemist shops and related formulators
Y3	Redundant drugs and medicines	As for Y1 and Y2 (hospitals, clinics, rest homes).
Y4	Waste biocides and phytopharmaceuticals	Manufacture of herbicides, weedkilllers; insecticides and plant growth regulators; warehouses, stock and station agents and suppliers of these materials; Commercial users and applicators
Y5	Wood preserving chemicals	Formulators and suppliers of copper, chromium and arsenic, and other permanent wood treatment agents, derivatives of pentachlorophenol, quinolates and other antisapstain agents, and other wood preserving or non decorative protecting materials.
Y6	Organic solvents	Manufacturers and users, most organic chemical manufacturers, formulators and commercial users. Paint, ink, resins, etc.
Y7	Heat treatment cyanides	Metallurgical industries with special heat treatment facilities. Spring makers, etc
Y8	Waste mineral oils	Motor vehicle and other engine workshops Bus depots and bases for machinery contractors Waste oil collecting bases and re-refining activities
Y9	Waste oil, hydrocarbon, water mixtures and emulsions	Port facilities for bilge contents Sources for Y6 and Y8 above Cutting oils and wastes from metalworking operations Sumps and interceptor maintenance
Y10	PCBs, PCTs, PBBs	Waste substances or articles containing or contaminated with dielectric fluids in electrical equipment or hydraulic fluids. Manufacture of non-carbon copying paper
Y11	Tarry residues	Oil re-refining; carbonising processes; pyrolytic processes Distillation bottoms
Y12	Paints, inks, dyes, pigments,	Inks, including printing operations Lacquers, varnish, etc. dyes formulation and use Paint pigment, lacquers or varnish formulation and manufacture
Y13	Resins, glues, adhesives, latex, plasticisers, etc	Plastic product manufacturers Chemical manufacturers Plastic boat/pool fabricators
Y14	Waste chemical substances	Universities, polytechnics, secondary schools; hospital laboratories arising from research and research centres, development or teaching activities
Y15	Explosive wastes	Quarry operations, contractors. Processes using organic peroxides and other highly reactive materials
Y16	Photographic chemicals	Chemical manufacturers/supplies; film and processing materials production/laboratories Film processors
Y17	Surface treatment of metals and plastics	Galvanising, anodising, powder coating. Other surface treatment and processes
Y18	Residues from industrial waste disposal operations	On site and off site treatment processes
Y46	Wastes collected from households	
Y47	Residues arising from the incineration of household wastes	

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TABLE YB: HAZARDOUS CONSTITUENTS

Code	Constituent
Y19	Metal carbonyls
Y20	Beryllium; beryllium compounds
Y21	Hexavalent chromium compounds
Y22	Copper compounds
Y23	Zinc compounds
Y24	Arsenic; arsenic compounds
Y25	Selenium; selenium compounds
Y26	Cadmium; cadmium compounds
Y27	Antimony; antimony compounds
Y28	Tellurium; tellurium compounds
Y29	Mercury; mercury compounds
Y30	Thallium; thallium compounds
Y31	Lead; lead compounds
Y32	Inorganic fluoride compounds
Y33	Inorganic cyanides
Y34	Acids
Y35	Bases
Y36	Asbestos (dust and fibres)
Y37	Organic phosphorus compounds
Y38	Organic cyanides
Y39	Phenols, phenol compounds including chlorophenols
Y40	Ethers
Y41	Halogenated organic solvents
Y42	Other organic solvents
Y43-44	Polychlorintaed dibenzo furans or dioxins
Y45	Other organohalogen compounds
Y48	Radioactive substances
Y49	Contained gases
Y50	Contaminated soils from remediated sites

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Group	Contaminant	Screening Criteria = 20x TCLP (mg/kg)	TCLP Threshold (mg/L)	Source of TCLP criteria [1]
Inorganics	Antimony	40	2	c
	Arsenic	100	5	a
	Barium	200	10	b
	Beryllium	20	1	a
	Boron	2800	140	c
	Cadmium	20	1	a
	Chromium(VI)	100	5	a
	Copper	28	1.4	d
	Lead	100	5	a
	Mercury	4	0.2	a
	Molybdenum	100	5	a
	Nickel	40	2	a
	Selenium	20	1	a
	Silver	100	5	a
	Zinc	160	8	d
	Fluoride	3000	150	a
Petroleum hydrocarbon	Benzene	10	0.5	a
	Toluene	280	14	a
	Ethylbenzene	600	30	a
	Xylene	1000	50	a
	Naphthalene	1	0.05	b
Substituted aromatics	Aniline	100	5	b
	Styrene	60	3	a
	1,2-Dichlorobenzene	86	4.3	a
	1,2,3-Trichlorobenzene	20	1	c
	1,2,4-Trichlorobenzene	10	0.5	c
	Phenol	280	14	a
	2-Chlorophenol	0.4	0.02	b
	2,4-Dichlorophenol	0.4	0.02	b
	2,4,6-Trichlorophenol	40	2	a
Chlorinated solvents	Dichloromethane	172	8.6	a
	1,1,1-Trichloroethane	600	30	a
	1,1,2-Trichloroethane	24	1.2	a
	Vinyl chloride	4	0.2	a
Pesticides	2,4-D	200	10	a
	Aldrin	0.02	0.001	d
	Dieldrin	0.08	0.004	c
	Endosulfan	4	0.2	b
Other	Tributyltin	0.04	0.002	d

Note 1:

a - NSW EPA (1999) *Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-*

b - NZS 9201:Part 23 Trade Waste (2004), *Model General Bylaws*

c - MoH, 2005 *New Zealand Drinking Water Standards* . Values x100.

d - ANZECC (2000) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality - freshwater, 95% level of protection. Values x1000.*

Explanation to table

The principal test used for assessing chemical constituents of waste material is the Toxicity Characteristic Leaching Procedure (TCLP). This estimates the potential for the waste to release contaminants into landfill leachate.

The Screening Criteria in the table are derived from the TCLP values. If a waste has contaminant concentrations below the Screening Criteria, it is not possible for the TCLP criteria to be exceeded.

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Use of acceptance criteria table by disposers

The following process can be used to determine whether a waste material will meet the hazardous waste acceptance criteria for Silverstream Landfill:

- If the contaminant concentration in the waste is below the screening criteria, then TCLP testing is not required and the waste will be accepted, providing other relevant criteria are met (e.g., physical characteristics of waste).
- If the contaminant concentration in the waste is above the screening criteria, then TCLP testing is required. If the TCLP result is below the acceptance guidelines, then the waste will be accepted providing other relevant criteria in the Landfill Waste Acceptance Policy have been met.
- If the TCLP result exceeds the acceptance guideline, then the waste will need to be treated, as appropriate, to reduce this level to below the limit.

Immobilisation of chemical contaminants

Immobilisation of a contaminant in waste may be the result of a specific treatment process that the waste has been subjected to, or it may be a natural physical or chemical property of that type of waste.

Waste generators/disposers will need to seek approval from HCC of the immobilisation of specified contaminant(s) contained in a particular type of waste. Approval will be considered on a case by case basis on the production of supporting evidence.

The preferred treatment options for waste involve the removal or destruction of the toxic contaminants to achieve leachable levels below the acceptance limits. Dilution without achieving immobilisation of contaminants is not an acceptable waste treatment option.

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Appendix D - Conductivity and Surface Water Monitoring

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Silverstream Landfill

Daily Monitoring Log

Month: **Year:**

Measured by:

Day	Conductivity				Stormwater V Notch	Appearance at SW4 N = none, SL = slight, M = moderate, H = high			
	SW1	SW2	SW3	SW4	Weir L/Sec	cloudy	algae	foam	odour
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
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18									
19									
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21									
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24									
25									
26									
27									
28									
29									
30									
31									

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Appendix E - Reports and Inspection

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d by:

	Inspection Item (Refer Section 6 of the Specification)	Compliant				Photo Ref No.	Comments and/or Actions Required
		Yes	IR*	No	NI**		
		* IR = Improvement Required ** NI = Not inspected					
	General appearance						
	Landfill facilities office/kiosk/weighbridge etc maintained and tidy.						
	Grassed areas maintained and trimmed, weeds controlled on the landfill front face.						
	No loose litter in public areas.						
	Signage & markings clean and tidy.						
	Kiosk/office always staffed and kept tidy.						
	Health and Safety						
	Sample activity observed - Compliant with the accepted Contractor's SSSP.						Activity observed:
	Roads and hardstanding areas in safe condition.						
	Layout and signage at tipping area safe and clear.						
	Any separate contractors on site are inducted and activities coordinated (if applicable).						Separate contractor:
	Reporting						
	Reports submitted on time, as specified, including the Contractors inspection of site, carbon reduction plan, monthly and annual reports.						
	Submission of water quality results as per specification						
	Customer and financial management						
	Gates opened and closed on time						
	Minimal customer waiting time at weighbridge						
	Kiosk and staff courteous and helpful						
	Customer account and Landfill financial management implemented as per specification						
	Transfer station						
	Transfer station surfaces kept tidy and free from refuse, litter and silt, including transfer pit and loadout area						
	Hazardous waste drop off area is operated as specified including the roles and responsibilities of the on-site concierge. Waste logs and invoices received timeously.						
	Recycling drop off facilities are tidy and well serviced						

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	beyond site boundary with the potential to result in complaints.						
	Windblown litter control practices including litter fences are suitable and maintained. No excessive litter around landfill or on the landfill front face						
	Birds and vermin numbers are adequately controlled such that they do not impact neighbours or landfill users. Adequate best practices measures are being utilised for this purpose.						
	Dust control practices are suitable, and no excessive dust being generated. No dust is blowing off site or impacting on neighbours, customers, contractors, the gas plant and subcontractors.						
	Good refuse compaction is being achieved as specified, including layer thickness control and tracking number of passes to create a well compacted surface. Void space utilisation of 1t/m3 is achieved.						
	Special waste managed in accordance with Specification and Management Plans. Health, environmental hazards and nuisances are adequately controlled.						
	The active landfill tip face kept is well managed and within permitted size limits as per consent. Daily cover is applied at the end of each day						
	Intermediate or final capping is constructed in accordance with the Specification. No adverse environmental impact and nuisances are minimised.						
	Stormwater drainage systems are operating properly and are well maintained. Erosion and sediment controls are in place, operational and well maintained.						
	Leachate drainage systems operating properly and well maintained. No contaminants are entering the stormwater system.						
	Sealed and unsealed roads well maintained and can be used in all weather conditions. Line markings, signage and traffic management is adequate and consistent with Management Plans Sealed roads are free from silt.						
	Operated within resource consent parameters.						
	General compliance with the LMP, Specification and Contractor's Operation Plan.						

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ving information to be attached to the monthly report:

achment A: Daily quantities of waste (by type) received at the Landfill for each day of the month and totals for the month.

achment B: Quantities and type of waste and charges by account for each day of the month and totals for the month.

achment C: Quantities of waste from the transfer station that have been directed offsite (I.e Recycling, Greenwaste, Hazardous waste dro

achment D: Monthly Filling Plan.

achment E: Water quality monitoring results.

Monthly Report summary

	Feb 23	Mar 23	Apr 23	May 23	Jun 23	Jul 23	Aug 23	Sep 23	Oct 23	Nov 23	Dec 23	Jan 24
nes												
tonnes per Day												
Commercial waste,												
aste, tonnes												
e, tonnes												
vaste (excluding), tonnes												
, tonnes												
station (Domestic),												
ollection from Lower er Hutt, tonnes												
iate cover placed, m^2												
hot or trapped, No. s												

Health and safety

near misses and health, safety and wellbeing incidents (carry over unresolved incidents from previous months))

	Near miss or unsafe incident	Description of incident	Injury? Y/N	Action required/taken	Re Y/

Environmental incidents

	Description of incident	Off site impact? Y/N	Action required/taken	Resolved? Y/N

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Maintenance works

ors inspection ID	Details	Completed (Y/N)	Completion date (Expected completion not yet completed?)

Details of waste filling and engineering works undertaken

m	Comments
ling	Refer to Filling Plan and drawing .....
iate cover	
ter runoff controls	
nd sediment control measures	
ents to the gas collection	

Details of the asbestos disposal area

	Comments
management plan compliance	

Contractor performance deficiencies identified by the Engineer and notified to the Contractor

notification ngineer	Performance deficiencies identified including whether notified as a minor, moderate or major non-conformance	Action taken	Demerit points

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- 'Notices to Contractor' and 'Notices to Engineer' issued

ssue	NTC/NTE number	Subject	Current status

- Complaints received

omplaint	Location of complaint	Details of complaint	Actions taken

- List of all emergencies arising in connection with the carrying out of the Contract Works and/or the Site

emergency	Details of emergency	Actions taken

- **Other matters** (List any other matters in connection with the carrying out of the Contract Works and/or the Site)

	Details of matter	Actions required or taken

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Schedule 28 - Landfill Management Plan

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REPORT

Tonkin+Taylor

Silverstream Landfill Stage 2 Management Plan

Prepared for
Hutt City Council
Prepared by
Tonkin & Taylor Ltd
Date
January 2023
Job Number
82948.210

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Exceptional thinking together
www.tonkintaylor.co.nz

Document Control

Title: Silverstream Landfill Stage 2 Management Plan					
Date	**Version**	**Description**	**Prepared by:**	**Reviewed by:**	**Authorised by:**
Feb 2010	1	Silverstream Landfill Stage 2 Management Plan	s7(2)(a) [redacted]		
Sep 2017	2	Silverstream Landfill Stage 2 Management Plan – updated draft			
April 2018	3	Silverstream Landfill Stage 2 Management Plan – updated draft			
Aug 2018	4	Silverstream Landfill Stage 2 Management Plan – finalisation of previous draft updates			
May 2019	5	Silverstream Landfill Stage 2 Management Plan – incorporation of additional gas management procedures			
Mar 2022	6	Silverstream Landfill Stage 2 Management Plan – General update to align with contract			
Jan 2023	7	Silverstream Landfill Stage 2 Management Plan – General update to align with contract			

Distribution Register

Parties	**Abbr.**
GWRC Compliance Officer	GWRC
Landfill Operator	LO
Engineer to the Contract (Consultants)	EC
Gas System Operator	GSO
Construction Contractor	CC

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1 Introduction

1.1 Purpose

This Landfill Management Plan (LMP) sets out operating and management procedures for the Silverstream Landfill Stage 2 ("the Landfill") that will be adopted by Hutt City Council (HCC) as the owner of the Landfill. The LMP provides details of operational and monitoring requirements and external controls on the Landfill.

The LMP is the primary planning and operational document for all site personnel, contractors and regulatory authorities. The LMP is to be regularly updated to cater for subsequent episodes of detailed design related to the phased development of the Landfill, changes to regulatory or design criteria, or changes to resource consent conditions.

1.2 Objectives

The following management objectives are set out for the Landfill:

- To operate in full compliance with the resource consent requirements and demonstrate this through open reporting procedures.
- To liaise closely with neighbours and the local community, regarding Landfill operations issues.
- To minimise adverse effects on the environment as a result of site operations.
- To provide a safe working environment for people on the site.
- To efficiently and economically utilise the site's capacity.

This LMP documents how the site will be managed, operated and monitored to achieve these objectives, including during the aftercare period.

1.3 Operational policies

HCC requires the Landfill to be engineered to accepted modern landfill standards. The Landfill will embody all of the key modern landfill engineering, management and environmental protection features necessary to enable the Landfill to perform to these standards.

The Landfill is to be operated at all times in accordance with the conditions attached to its resource consents and other planning approvals, such as the Trade Waste Permit. The Landfill shall be operated in accordance with accepted best practice.

The operations quality plan will provide the contractual information on how this LMP will be implemented.

1.4 Standards

All work will be undertaken to the most up-to-date standards applicable in New Zealand in accordance with all regulatory requirements.

The Landfill is designed using the accepted good practice for Municipal Solid Waste Landfills as at October 2003. The Landfill design elements have been developed to be consistent with the intent of the USEPA Subtitle D regulations for Municipal Solid Waste Landfills. The Landfill design will also meet or exceed the recommendations of the Technical Guidelines for Disposal to Land (WasteMINZ, April 2016).

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The Landfill is designed for:

- Disposal of only municipal solid waste and approved non-hazardous special wastes.

The Landfill design incorporates:

- An engineered containment system.
- A leachate drainage, extraction and removal system.
- A landfill gas control and monitoring system.
- An engineered final capping system.

1.5 Status of LMP

The LMP is the primary operational document for the construction, operation, closure and after care of the landfill. The need to comply with the requirements of the LMP will be specifically referenced in contracts for the construction and operation of the landfill.

1.6 Document control

The distribution of the LMP will be controlled to ensure only up-to-date copies are in circulation. To achieve this, a Document Distribution Register will be maintained. Subsequent updates of the LMP will be issued to those on the Register. A record of changes to the document will be recorded on the Distribution Register. The Distribution Register is provided at the start of this document.

1.7 LMP review

The LMP will be reviewed at least annually. Proposed revisions will be forwarded to the Consents Manager, GWRC and notification of updates will be made to those on the Distribution Register.

1.8 Health and safety

All Persons Conducting Business (PCBUs) including the Landfill Operator (LO), Gas System Operator (GSO), Construction consultant, HCC and their Engineering consultants shall take all reasonable steps to safeguard the health and safety of all employees, and any person within the Landfill in accordance with the Health & Safety at Work Act 2015. Site specific, task oriented, risk assessments, separate from this Operational Management Plan, are required. The LO will prepare the overarching site safety plan, induction material, and hazard information, and update these as required. This plan outlines the health and safety responsibility of each PCBU that operates at the landfill. All other contractors who work on site will also need to prepare safety plans/risk assessments to cover their activities.

1.9 Resource consents

The resource consents granted for the Landfill are listed in Table 1. Copies of the consents are provided in Appendix A. Table 1 also includes those resource consents for Stage 1/1A of the landfill that remain active. Resource consent WGN040184 [33374] Discharge to Tip Stream and Resource consent WGN110202 [30861] Stage 1 disposal consent was updated via a S127 application, submitted to GWRC in June 2019, the approved decision letter was issued in August 2019. The new Resource consents WGN040184 [36288] and WGN110202 [36380] is included in the table below.

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Table 1 - Resource consents for Stage 2 Silverstream Landfill

Consent No.	Consent Information	Expiry Date
WGN040184 [23248]	Discharge to land. To discharge waste, fugitive leachate and other site-generated liquid to land, in circumstances where contaminants may enter water.	13 May 2039
WGN040184 [33373]	Discharge to air. To discharge landfill gas, exhaust gases, dust, odour and other contaminants to air from a landfill.	13 May 2039.
WGN040184 [23250]	Water permit. To dam and divert Tip Stream for the purpose of creating a sedimentation pond.	13 May 2039
WGN040184 [36288]	Discharge to water. To discharge uncontaminated stormwater, groundwater and treated stormwater from a sedimentation pond to Tip Stream.	13 May 2039.
WGN040184 [23253]	Land use. To construct a sedimentation pond, dam, lined channel and drop structures in the bed of Tip Stream.	13 May 2039
WGN040184 [23254]	Water permit. To divert ephemeral streams and existing drains to a sedimentation pond.	13 May 2039
WGN040184 [23256]	Land use. To construct diversion structures in the beds of tributaries of Tip Stream for the purpose of stormwater management.	13 May 2039
WGN040184 [23259]	Land use. To undertake earthworks associated with the formation of roads and tracks.	13 May 2039
WGN040184 [23260]	Land use. To excavate the floor and side slopes of the landfill and to operate borrow areas for the supply of construction and cover materials.	13 May 2039
WGN040184 [23261]	Land use. To clear vegetation from the landfill footprint, access roads, drains and the borrow area.	13 May 2039
WGN040184 [23262]	Land use. To construct bores for monitoring groundwater quality.	13 May 2039
WGN040184 [23263]	Land use. To reclaim a section of Tip Stream for landfilling purposes.	Unlimited
WGN970164(02) [33375]	Discharge to Water. Discharge stormwater and stormwater contaminated with suspended	2 July 2032.

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Consent No.	Consent Information	Expiry Date
	sediment associated with earthworks and roading via the landfill stormwater system to Tip Stream	
Stage 1 consents:		
WGN970164 [33376]	Discharge to Water. Discharge fugitive leachate arising from the construction, operation and management of the landfill to groundwater below the landfill	2 July 2032 Consent updated 1 May 2017 to delete Condition 16 and 20, and alter the trigger exceedance reporting process specified in Condition 18.
WGN970164(04)	Discharge to Air. Discharge contaminants to air including fugitive dust, fugitive landfill gas (including methane and CO^2), odour, and other gases and particulates arising from the construction, operation and maintenance of the landfill including the landfill surface, transfer station, recycling area, borrow areas, roads and tracks.	2 July 2032
WGN970164(05)	Water Permit. Divert stormwater and stormwater contaminated with suspended sediment associated with earthworks and roading via the stormwater system to Tip Stream	2 July 2032
WGN970164(06)	Water Permit. Divert existing drains and ephemeral streams to Tip Stream	2 July 2032
WGN970164(07)	Water Permit. Take, by means of an underground drainage system, groundwater contaminated with leachate for disposal to the sewerage system	2 July 2032
WGN970164(08)	Water Permit. To dam water in three silt ponds	2 July 2032
WGN980122	Land Use. Extract up to 50,000m^3 of rock per year	20 January 2033
WGN110202 [36380]	To discharge waste material including but not limited to sharp or abrasive material, asbestos containing materials and sludge, onto and into land in circumstances where the associated contaminants may enter water.	2 July 2032.

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2 Landfill management

2.1 Management Structure

The Landfill is owned by Hutt City Council. The responsibility for the successful operation of the Landfill and its compliance with resource consent conditions lies with the Solid Waste Manager. The day-to-day operation of the Landfill is undertaken on behalf of the Council by a contractor. The Council engages a specialist consultant to oversee the operational and capital development contract and undertake Landfill design and planning activities.

The operational contract for Stage 2 is performance-based and requires the operator to meet clearly defined operational objectives. These objectives are measurable whereby financial incentives and or penalties are utilised to achieve them..

2.2 Roles

There are five main parties involved in the operation of the Landfill and their roles and responsibilities are set out in Table 2:

- Hutt City Council (HCC),
- Landfill Operator (LO),
- Gas System Operator (GSO),
- Construction contractor, and
- Engineering consultants (responsible for Landfill design, construction, environmental monitoring and operational supervision).

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Table 2 – Roles and responsibilities

Responsible party		Role
Owner	Hutt City Council	Overall responsibility for environmental management, compliance with resource consents, and implementation of LMP. Solid Waste Manager
Operations Contractor	Landfill Operator	Landfill Manager Compliance with resource consents Recordkeeping, including daily diary, nature of refuse, complaints register, and water quality.
Kiosk Operator		Inspect incoming waste, check manifests, collect fees
Engineer to Contract	Engineering Consultants	Administer operations contract
Engineer's Representative		Assist Engineer to Contract
Environmental Monitoring Manager and special waste acceptance		Oversee monitoring programme, interpret results, prepare quarterly reports, review special waste disposal applications
Gas System Operator		Operation of the generators in the electricity plant and flare to ensure ongoing destruction of landfill gas and management of the gas field.
Construction contractor		Physical construction of new Landfill slopes, including appropriate testing and quality control.
Refuse recycling contractor		Earthlink is an incorporated Society, helping individuals to return to the work by collecting items at the landfill transfer station, and repairing those items for sale off-site.
Compliance parties		
Greater Wellington Regional Council		Monitoring to ensure compliance with consent conditions
Trade waste system operator		Monitoring to ensure compliance with Trade Waste Permit

2.3 Community involvement

HCC has established a Community Liaison Group. A Charter has been developed and signed between the Community Liaison Group and the Council. The basis of the Charter is that Council will be a good neighbour. The purpose of the Charter is to establish effective communication between the respective parties and to ensure that there are no significant adverse effects from landfill construction or operation on the community. The Community Liaison Group has met quarterly since 1999.

The Landfill Manager will operate the Landfill in a manner consistent with the aim of the facility to be a good neighbour.

The public have the right to approach the LO and HCC in the event of unexpected problems of nuisance from the Landfill operation.

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2.4 Complaints

All employees of the Contractor will be trained to immediately report any complaints from clients, site visitors, neighbouring property owners, or the surrounding community to the Landfill Manger's office. All complaints received regarding the landfill operation will be recorded in a Complaints Register maintained by the Engineering Consultants in accordance with Condition 16 of Resource Consent WGN 970164(04).

The Register will record the following where practicable:

- The name and address of the complainant, if supplied;
- Identification of the nature of the complaint;
- Date and time of the complaint and alleged event;
- Weather conditions at the time of the alleged event;
- Results of investigations; and
- Any mitigation measures adopted.

The complaints record shall be made available to Wellington Regional Council on request. Wellington Regional Council shall be notified of any complaints received that relate to resource consent conditions within 24 hours or on the next working days. A brief report shall be prepared by the Environmental Monitoring Manager summarising recent activities at the landfill and the weather conditions recorded at the landfill at the time that the odour was observed. The summary report shall be forwarded to the Solid Waste Manager and the Regional Council Compliance Officer.

In the event that the Regional Council are notified directly of odour complaints, they shall notify the Environmental Monitoring Manager within 24 hours or the next working day so that the Complaints Register can be updated and a summary report can be prepared.

2.5 Staff

The ability of the Landfill to be operated in an effective and efficient manner is closely related to the competence of the staff. All personnel working on site or with site responsibilities will be required to undertake a formal site induction process. Part of this Induction will be a segment on environmental management including the contents of the LMP. The site induction should be retaken by all employees and contractors annually. A record of all such training, including the information and attendees, is to be maintained by the LO.

Ongoing training requirements for landfill staff include:

- Awareness of contingency plans and required actions
- Waste acceptance
- Identification of sources of odour
- Recognition of nuisances
- Awareness of equipment condition

The requirements for suitably qualified staff and ongoing training will be included in the landfill operating contract.

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3 Landfill design and construction

The final landfill design and construction requirements are described in detail in the Silverstream Landfill Stage 2 Engineering Report (Appendix D). Key aspects are summarised below.

3.1 Design principles

The design approach includes, but is not limited to:

- Construction of an optimal landfill envelope within the valley while providing for overall surface drainage requirements and cognisant of perimeter cut-slope geometry;
- Providing for permanent leachate discharge from the Stage 1/1A landfill area;
- Maintaining a minimum buffer zone of 300m to the nearest neighbours, with favourable topography in between;
- Design of the landfill footprint, base grades, and liner elements to cater for the high level of regional seismicity;
- Design of the liner to cater for the highly variable subgrade geology and difficult topography;
- Ensuring "global" landfill stability through:
  - providing effective subsoil drainage in the floor of the valley;
  - minimising leachate head within the landfill by using effective leachate drainage systems;
  - buttressing of the toe area of the landfill into a major ridgeline and toe bund;
  - incorporation of appropriate liner design elements, particularly in the lower landfill area.
- Providing a robust, effective leachate drainage system with ready access for cleaning and rehabilitation;
- Controlling stormwater and moisture ingress into the landfill such that the site is able to be operated without risk of problems associated with stormwater infiltration;
- Providing for active landfill gas extraction at an early stage and throughout the active and post-closure phases;
- Incineration of landfill gas in an approved flare and or engine for appropriate energy conversion for electricity generation;
- Utilising an effective cover system to ensure effective site rehabilitation, while minimising long term leachate generation; and
- Minimising active cell areas.

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3.2 Landfill development

The Stage 2 Landfill will comprise 5 principal phases each of 6-12 years duration. Within each phase there are a number of slopes (with a 6 m interbench). The development sequence is as follows:

- Earthworks to form sub base;
- Installation of underdrainage;
- Installation of liner;
- Installation protection layer;
- Installation of drainage layer;
- Placement of waste; and
- Placement of Intermediate or final capping.

3.3 Liner design and construction

The objective of the liner is to contain leachate and landfill gas generated within the landfill and limit their migration to underlying soil and groundwater. In order to optimise the void space available for waste placement, slopes have been designed to maximise gradient whilst maintaining an adequate factor of safety for formation and liner design. The complex nature of the geometry of the formation has necessitated the specification of four liner types, namely:

- Type A – base.
- Type B – slopes shallower than 1 vertical on 2 horizontal.
- Type C – slopes between 1 vertical on 2 horizontal and 1 vertical on 1 horizontal.
- Type D – slopes steeper than 1 vertical on 1 horizontal.

Details of the liner components are provided in the Design Report (Appendix D).

3.4 Leachate collection system

The leachate collection system intercepts leachate that collects on the liner and drains it by gravity to a low point, ultimately at the north end of the Landfill. It includes;

- A gravel blanket on the liner to promote efficient drainage and collection of leachate.
- Base drainage in a herringbone layout
- Perforated pipes underneath the landfill cap controlling leachate breakouts

The collection system has been designed so that:

- There are no liner penetrations.
- The main leachate collector drains and leachate sumps are readily accessible for cleaning and flushing.
- Leachate flows to the leachate sump under gravity. Leachate from the sump is gravity drained to the Stage 1 leachate outlet manhole and flows to the Hutt Valley wastewater sewer main on Eastern Hutt Road for discharge as trade waste.
- Leachate pipes are HDPE for durability and to accommodate curvature.

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3.5 Toe bund

An earth toe bund has been constructed to act as a buttress for the refuse within the landfill. The dam was constructed from selected on site material and keyed into the original ground to prevent sliding. The toe bund has two pipes passing through its base, these are for the leachate drainage system from Stage 1 and Stage 2.

Rention Pond – we need a section here on the pond and references the management documentation.

3.6 Landfill gas control

Landfill gas will be controlled by a system of active collection and destruction through the generation of electricity and a flare. The principal collection components will be combination of horizontal and vertical gas wells in the deeper, central area of the landfill. The wells will connect to a series of headers on the southern landfill face and a perimeter header main in the upper landfill area.

Construction of the landfill gas system will proceed in parallel with cell filling. Once approximately RL 100 m is reached, landfill gas will be extracted to the landfill gas plant. As filling progresses, layers of horizontal wells will be incorporated approximately every 6-12m vertically along new airspace benches.

3.7 Final cover

The proposed final cap is designed as a monolithic evapotranspirative cover system. From top to bottom, it comprises:

- 100mm thick topsoil or growth layer (grassed as soon as practicable to minimise erosion and scouring)
- 200mm thick growth layer
- 1200mm thick compacted clay layer (k < 10-7 ms-1)
- 400-500mm thick intermediate cover layer.

Overall, the structural component of the cap will be typically 2m or more in thickness and is expected to perform well in relation to shedding stormwater and controlling moisture ingress to the landfill.

3.8 Landscaping

The proposed final grades are aimed at optimising the airspace of the landfill over the design footprint, recognising landscape, visibility, shelter, and construction issues. The upper area of the landfill is designed to integrate with the existing Stage 1/1A landform to create an appropriate final overall landform. The proposed maximum level of the completed landfill is at RL 195m which corresponds to the high point in Stage 1A.

The slope of the final contours ranges from 1V:10H to 1V:3H. The shape and slope of final grades allows for access for construction and maintenance of the final cap, landscaping, and end use, while maximising air space.

A grass cover for the final landfill surface is considered optimum as it minimises the potential to disturb the capping layer, allows for ease of access and makes it easier to recognise potential problems such as leachate breakout or slumping for example.

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4 Landfill operation

4.1 Hours of operation

The normal hours of operation when the landfill is open to the public will be as follows:

- Monday to Friday: 7:30 a.m. to 5:00 p.m.
- Saturdays:
  - New Zealand Standard Time: 8:00 a.m. to 5:00 p.m.
  - Daylight Saving Time: 8:00 a.m. to 6:00 p.m.
- Sundays & Public Holidays:
  - New Zealand Standard Time: 9:00 a.m. to 5:00 p.m.
  - Daylight Saving Time: 8:00 a.m. to 6:00 p.m.

The landfill will be closed on Good Friday, Christmas Day and New Year's Day.

Work on the site for covering of waste and maintenance operations may continue beyond these hours. The acceptance of material may be allowed outside normal operating hours in special circumstances.

4.2 Traffic

Commercial and domestic vehicles shall be separated on site.

- Domestic vehicles will be limited to the drop off facility and recycling area.
- Access to the front face will be limited to commercial vehicles. This will help minimise the area of the active face.

Access to other areas will be at the approval of the Landfill Manger.

4.3 Waste acceptance

The Landfill will operate as a Municipal Solid Waste (MSW) Landfill and will accept only non-hazardous residential, commercial and industrial solid waste, and manageable sludges. Bulk liquids will not be accepted for Landfill disposal.

Special waste must meet waste acceptance criteria and the Engineering Consultant can assist with accessing waste against the criteria.

Waste acceptance protocols will be implemented to ensure that:

- The receiving environment is protected.
- The health and safety of Landfill staff is protected.
- The waste received is compatible with the landfilling operation.

The waste acceptance criteria are detailed in *Hutt City Council Landfills Waste Disposal Guide, April 2011* (Appendix C). The relevant information for customers is also detailed on the Hutt City Council website (http://www.huttcity.govt.nz).

4.4 Kiosk operation

The Landfill kiosk is important in ensuring efficient landfill operation. The role of the Landfill kiosk is as follows:

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- Inspect incoming waste (as practical) to ensure compliance with the Landfill's Waste Acceptance Criteria
- Check load manifest
- Inspect loads to ensure loads are secure
- Communicating with the operators at the landfill face
- To record the nature and weight of incoming refuse
- Confirm approvals in place for special waste
- Collect landfill fees
- Direct vehicle drivers to the appropriate unloading area.

The kiosk operator may be either the Landfill Manger or another Contractor.

4.4.1 Acceptance of refuse

The Landfill Kiosk Operator is responsible for ensuring the incoming refuse to the landfill complies with the landfill waste acceptance criteria. The Kiosk Operator will check incoming loads to see they comply with waste acceptance criteria. The Kiosk Operator will accept load manifests and check to see they are correctly filled in.

The Kiosk Operator is to ensure kiosk staff are trained in the requirements of the landfill waste acceptance criteria and manifests.

The Kiosk Operator will utilise suitable tools to assist in determining the nature of the waste arriving at the landfill (e.g., mirror or close circuit TV to see into trucks).

The Kiosk Operator shall ensure that a suitable communications system is in place so the kiosk operator can contact the operators at the landfill face or the drop-off facility. The kiosk operator should advise the Landfill Operator of any suspicious loads which need to be vetted.

The Kiosk Operator shall check to see that the arrival of waste requiring special handling has arrived at the agreed time and alert the operators at the landfill face.

4.4.2 Insecure loads

The Kiosk Operator shall inspect all incoming loads to ensure they are securely tied down. The Kiosk Operator shall advise drivers of vehicles with insecure loads requiring the loads to be securely fastened. In the event of a vehicle regularly having insecure loads, the Kiosk Operator shall record the registration number of the vehicle and provide the information to the Solid Waste Manager.

4.4.3 Recording

The Kiosk Operator shall be responsible for weighing all commercial vehicles entering and leaving the landfill and determining the weight of the refuse disposed of. The Kiosk Operator shall also record the type of commercial waste being disposed, using the product ID, and product name. The type of vehicle shall also be recorded.

The weight, refuse description and vehicle type will be entered into "Weightrax" a software package provided by the Solid Waste Manger for keeping landfill records.

4.4.4 Landfill fees

The Kiosk Operator will be responsible for the collection and management of landfill fees. The Kiosk Operator is required that no cash is kept at the landfill overnight to reduce the potential for burglary at the kiosk.

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4.5 Placing of refuse

4.5.1 Refuse placement and cover operations

Refuse shall be placed in a cellular fashion incorporating daily and intermediate cover, in accordance with accepted landfill practice.

When a new cell is required, filling operations will begin with the cutting of "windows" nominally 30 metres square through the previous layer of daily or intermediate cover. Windows will be cut on approximately a weekly basis. Windows shall be of sufficient size to provide effective connection between cells and may be varied in size to suit operating conditions and cell arrangements.

Both upslope and downslope refuse placement operations may be used, although upslope operation will be given preference because better compaction of waste is obtained at the toe of the fill slope.

For the first 2 m above the liner zone and leachate drains, refuse shall be selected so as to ensure continuity of drainage and avoid damage to the liner and drains from angular material in the refuse (see Section 4.5.2 for detail).

The working surface of each refuse cell will be minimised in order to reduce the exposed refuse surface and optimise the quantity of daily and intermediate cover required. The width of the working face will be such as to allow room for the manoeuvring of the expected traffic volumes at the working face. The thickness of each typical refuse cell will be approximately 4 m.

The working face will be typically operated with a slope not steeper than 4 horizontal to 1 vertical or flatter than 6 horizontal to 1 vertical, but will typically be finished with a slope of 4 horizontal to 1 vertical prior to placing daily cover. Steeper slopes may be permitted on a temporary basis if approved the Engineer to the Contract.

4.5.2 Initial placement of waste in new cell

The following engineering works are required in advance of any waste being first placed:

- Geotextile filter to leachate drainage stone: prior to placing any waste into the Stage 2 the leachate collection layer is to be covered with geotextile. The geotextile is to cover the full floor base area and extend 2.0m up the side slopes (to 1m vertically above the base stone level). The geotextile is to be lapped 500 mm.
- Leachate drainage stone and HDPE protection: as waste is placed up the side slopes the stone leachate drainage layer and protection geotextile and geogrid must be extended up the slope. This is to be achieved as follows:
  - Uncover the existing protection geotextile and geogrid by removing the temporary plastic sheet covering and sand bags.
  - Lay the existing geotextile and geogrid down the slope.
  - Place additional geotextile and geogrid up the slope lapped to the existing to a minimum vertical height up the slope equal to the height of the proposed drainage stone lift plus a further 2 m up the slope, to allow for movement down the slope as the waste settles and provide a lap for the next lift. In order to minimise the number of joints in the geotextile and geogrid greater lengths may be placed up the slopes than required for a single lift of stone as long as the geotextile and geogrid are not exposed to sunlight for longer than two months (see below).
  - The geotextile is to be lapped to the existing geotextile by a minimum of 0.3 m and heat bonded to it.
  - The geogrid is to be lapped to the existing geogrid and laced to it in accordance with the manufacturer's instructions.

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- Leachate drainage stone to a minimum thickness of 300 mm is then to be placed over the protection geotextile/geogrid up the side slope. Experience during construction of Stage 2 indicates that a 2 m vertical stone lift is achievable, but this may be increased if higher lifts are proven to be stable. Note, if the lift height of the stone is too high, the stone, geotextile and geogrid will slide down the slope.
- Exposed protection geotextile and geogrid above the leachate drainage stone are to be rolled up and protected from UV degradation with the gas inhibitor if the geotextile is to be exposed for longer than two months.
- At the top of the leachate drainage stone (at bench level) HDPE gas inhibitor will be installed, to prevent gas egress from the leachate gravels. A sacrificial nova coil may be installed under the gas inhibitor and connected to the gas extraction system. The gas inhibitory is to be capped with approximately 200 mm of non-premium clay.

Initial filling in the base of Stage 2 shall commence with 'soft' waste that does not contain any materials that may result in damage to the lining system. This material should also not contain silty or clayey material that may clog the leachate collection layer. Typically bagged domestic refuse is appropriate but other selected wastes may be used as appropriate if they meet these criteria.

The following constraints apply to the filling operations:

- The first layer of waste is to be 'soft' waste/fluff layer, of minimum 1 m placed thickness spread carefully ensuring that there is always a minimum 1 m fluff layer prior to placement and compaction of primary refuse. A minimum thickness of waste of 2 m above the liner shall be in place before a trash compactor is used. Particular care should be taken not to disturb or damage any leachate collection pipes or gas collection pipes.
- New cells shall be progressively handed over to the operations contractor and the remaining areas isolated from the waste as clean stormwater areas. Rainfall collected in the clean stormwater areas will be diverted to the stormwater drains in order to prevent significant volumes of clean water unnecessarily entering the landfill.
- In a new lined cell the waste should be set back approximately 1 m from the HDPE cell perimeter bund to avoid leachate overtopping the bund.
- The waste slope rising from the toe bund shall be no steeper than 1V:3H to ensure stability without the approval of the engineer.
- Waste shall be placed level over the area of the cell in lifts no more than 2 m high filling from the centre towards the side slopes. This will minimise movements of the drainage stone on the side slopes. Note that some sliding movement of the geotextile/geogrid/drainage stone is to be expected on the side slopes as the weight of the refuse is applied and as waste settles. This is consistent with the design. Surplus geotextile and geogrid must be provided at the crest of new cells to allow movement on the surface of the liner while filling. The geotextile and geogrid must be allowed to move and should not be held too tightly in place.
- Waste shall be filled to no higher up the side slopes than 0.5 m below the top of the slope followed by placement of intermediate cover and the gas inhibitor detail.
- Material used for daily cover within 4 m over the leachate drainage stone layer shall be restricted to moderately or less weathered rock gravel i.e. no fine grained, silty or clayey material shall be used.
- Any waste filling from a high point to a low point that requires filling of the access ramp shall be conducted in conjunction with waste filling to a similar level to 20 m laterally on either side of the ramp. This is to ensure the stability of the access ramp.
- Engineering works, are to be carried out in conjunction with filling activities.

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- A turning 'pad' will then be created on the general waste filled area to allow all vehicles to access the cell, tip and turn on the pad.

4.5.3 Special waste placing procedures

All Special Waste will require a manifest for each load. The manifest will detail the information for the individual load and cross-reference the Special Waste Permit.

Wastes requiring special treatment will be identified during the acceptance procedure.

Special Waste will be disposed of by covering the waste with general refuse or cover material at the working face immediately after it has been deposited. The option of depositing some special waste into mature refuse will be applied where it is considered that the nature of the waste indicates that it should not be placed with fresh general refuse, where it could potentially be exposed to acidic conditions.

Waste that is potentially a health hazard for Landfill staff, or involves particular handling difficulty, will be deposited into a special burial area, 3 m deep into refuse. To ensure that special burial areas do not compromise the liner system and to maintain reasonable separation from the leachate collection system, the distance between the base of the special burial area and the liner will be greater than 3 m.

Special burials will be required to deal with certain wastes such as, for example, dead animals. These wastes will be placed in a special excavation within the refuse, in the current working area, and then immediately buried. The location of special burials will be recorded. No special waste is to be placed within 3 m of the base or sidewall liners. The location of the tip pad will be recorded and can be tracked with the contractor's monthly fill sequencing plan. This will include general and special waste. Acceptance certificates can be used to determine the time special waste is received in the active tip pad.

Table 3 – Special waste disposal

Special waste	Action
Milliscreenings	Spread and cover with refuse immediately
Asbestos	Dispose in the marked area between Stage 1 and Stage 2 and cover.
Contaminated Soil	Dispose at toe of the active landfill face and cover or within new area being developed in stage 1.
Animal Carcasses	Dispose at toe of the active landfill face and cover.
Treated Sewage Sludge	Treated sewage sludge with less than 50% solid concentration will require mixing with refuse at a ratio of no less than 1 part sludge to 8 part refuse to achieve stability requirements. At this stage it appears this is best achieved by spreading the sludge out on the landfill face and mixing in with other refuse. This requires monitoring to determine the most effective method.
Untreated Sewage Sludge	This material requires both mixing with refuse and immediately covering. Mix with other waste on landfill face then cover with fresh refuse. Any large unscheduled volumes of sludge requires the approval of the Engineers Representative before delivery can take place.
Other sludges	Mix in with other waste at landfill face. In wet periods it may not be accepted depending upon the handling characteristics of the sludge.

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4.5.4 Asbestos special waste

The disposal of asbestos shall be undertaken in a designated area in Stage 1, as per Resource Consent WGN110202 [36380]. All asbestos shall be placed into the designated consented area and no end tipping is permitted. The asbestos area shall not be compacted in order to minimise the risk of splitting the bags. Placement of asbestos waste in the disposal area is to be monitored by LO during disposal to ensure that all bags are sealed and intact. Should any bags be found to be not intact the area is to be covered immediately. Full intermediate cover is otherwise to be applied approximately every two to three days. The LO should implement their asbestos Management Plan.

4.6 Daily cover

Daily cover will be placed by the end of the day's filling operation. The daily cover will be placed to a depth of not less than 150 mm Placement of daily cover may begin prior to the closure of the landfill to commercial and public vehicles, however, the final placement of daily cover must be completed after the landfill is closed to public and commercial vehicles to ensure that all refuse delivered each day is covered.

Earth for use as daily cover in normal operating conditions will be sourced from a number of locations, primarily areas to be excavated for future cells and the landfill borrow areas. Moderately weathered rock may also be stockpiled for use as daily cover (where weather conditions make application of normal earth cover unsafe). Additional alternative daily cover products may be trialled, however, adoption of these into operating practise will be dependent on approval from the Consents Manager, GWRC. The trialling of alternative materials or methods will be discussed in advance with GWRC to ensure the trial produces the relevant information to assist GWRC in their assessment.

Some of the material to be used as daily cover will be stockpiled close to the working face area to reduce travel times of the daily cover haul vehicles at the end of the day and be available if adverse weather conditions require a quick end to filling operations. By the end of each day the active refuse face shall be shaped so that daily cover can be applied to the exposed refuse. This may include shaping and application of daily cover to some faces of the active area during the working day, if it is determined that these areas will become inaccessible by the end of the day. In addition, where achievable, the active slope shall be maintained at a gradient of 1V:4H or less to allow access of landfill machinery over the refuse in order to spread daily cover.

Daily cover contingencies:

Under conditions that preclude the placement of earth as daily cover, one of the following alternative daily cover options is to be used:

- Weathered rock to a thickness that visually obscures the refuse
- Cleanfill (crushed concrete etc that meets clean fill definition of MfE)
- Trial cover material, e.g. ConCover spray-on mulch, pending approval from council as described above.

In the event that exceptional circumstances prevent the application of daily cover (e.g. the active face is unsafe), then cover will be applied to the active face as soon as practicable. GWRC and the Community Liaison Group shall be informed of the situation within 48 hours, giving details and an estimated time when cover will be reapplied. Following the event a review shall be undertaken to assess the causes and whether the cover procedures require changing. The results of the review shall be forwarded to GWRC.

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4.7 Access Roads

The main access road (Reynolds Bach drive) provides passage for vehicles from Eastern Hutt road to the entrance way at the operator's kiosk. A number of other roads exist at the site including the sealed road to the transfers station and unsealed access roads to the active tipping area, asbestos disposal area and dam.

On-site access roads will be constructed with all-weather surfaces between the site entrance and the working face. Further access roads will need to be constructed as the Landfill progresses. All roads must be of an all-weather standard and of sufficient width to allow safe passage of heavy vehicles. Culverts will be provided, as required, to allow drainage of surface water beneath main access roads. Speed restrictions and appropriate markings shall be used to improve safety as appropriate.

The construction and maintenance of access roads to the tip face and other facilities on the waste fill shall be included in the Landfill operations and constructed and maintained by the Landfill Operations Contractor.

All site working areas will be maintained to enable safe and efficient operation during wet weather.

4.8 Wet weather operation

To allow for continuous operation of the landfill during unusually wet periods, a stockpile of roading and cover material will be established near the working face. This material will be used if the regular source cannot be accessed.

4.9 Machinery

The key equipment at the Landfill is typically expected to comprise:

- 1 Landfill Compactor (minimum 40t)
- 1 Bulldozer
- 2 Hydraulic Excavator
- 2 Articulated Dump trucks
- 1 Water truck
- 1 Transfer Station Waste Truck
- 2 Front end Loaders

The equipment on-site will vary over time depending upon the refuse volumes, construction and maintenance activities.

4.10 Compaction

4.10.1 Method

Refuse shall be compacted in the Landfill to target a minimum in-situ refuse density of 1000kg per cubic metre. This density includes (but not limited to) daily cover, capping, roading material, and settlement. The density is exclusive of final cover material.

The number of passes by a machine over the waste to achieve optimum compaction depends on a number of factors, including the type of machine, its ground pressure, the type of waste and the slope. The more passes made over the waste the better, but operational considerations mean that the number of passes should be in the range of three to five.

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Refuse shall be compacted in layers typically of 600 mm loose depth. Where possible the layers shall be sloped away from the sides and final surfaces of the Landfill. Placement of further layers of refuse shall not commence until waste already placed has been adequately compacted.

Bulky refuse items require special measures in their placement. Where possible, such items will be crushed by some mechanical means to reduce void space prior to placement at the base of the working face. These items are not to be placed in the final lift of refuse (they should be placed more than 1 metre deep in the refuse), since settlement of the refuse may result in such items piercing the cap.

4.10.2 Density testing

All refuse is weighed at the weighbridge.

From time to time the working area is physically surveyed, thus enabling the general compaction rate to be determined. During the interval between surveys, density targets can be checked using weighbridge data and estimated void utilisation.

4.11 Leachate management

Leachate generated in the Landfill will percolate down through the waste, until it reaches the top of the Landfill liner.

The base grades established on the top of the liner will ensure positive drainage of any leachate to the system of collector drains, which are accessible for cleaning downstream of the toe bund. The leachate collector drains to a gravity leachate line that connects with the Hutt Valley wastewater system. A leachate grit interceptor is located downstream of the toe bund to minimise the sediment load in the leachate. The sewage containing the leachate is treated at a Wastewater Treatment Plant.

4.12 Landfill gas management

The primary function of the Landfill Gas Control System (LFGCS) is to collect and combust gas generated in the Landfill in a controlled way.

Generally, horizontal and vertical extraction wells will be constructed prior to the placement of final cover, and (as the site develops) progressively installed with cell filling.

Details of the construction of the LFGCS are included in the Silverstream Landfill Stage 2 Engineering Report (Appendix D).

The landfill gas plant is currently managed and operated by the GSO, who are also responsible for installing, maintaining, and monitoring the landfill gas collection network over Stage 1 and Stage 2.

The GSO , maintains the generators at the gas plant and a flare for the destruction of landfill gas. The management of the gas extraction network is intended to maximise the volume of gas extracted from the landfill while maintaining the concentrations of methane and oxygen within the limits needed for efficient operation of the generators.

Monthly coordination meetings between LO , GSO, and the Consultant are held to facilitate good communication between the parties involved in operational and construction activities, discuss the progress of key performance indicators (KPIs) and the operation of the gas network. In addition, landfill gas monitoring over the surface of the landfill cap is undertaken by the Environmental Monitoring Manager and results provided immediately to both the Landfill Operator and Gas System Operator. At the monthly meeting one of the agenda items is to confirm that action has been taken address any adverse monitoring results.

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4.12.1 Landfill gas monitoring

Landfill gas monitoring is conducted in compliance with Consent WGN040184 [33373] Conditions 10, 12, 16, 17, and 18.

Concentration of gas at the landfill surface – methane concentrations are measured over the landfill in areas with final and intermediate capping using a hand-held gas analyser. The walkovers are conducted on a fortnightly frequency over Stage 2 and a monthly frequency over Stage 1. Walkovers are conducted along a pre-set walkpath, and methane concentrations are recorded at 100 mm above the surface. These surveys are used to inform the capping maintenance requirements, and to monitor methane concentrations with regard to condition 12. Geotechnics are engaged to carry out the methane (H_2S) surveys.

Gas monitoring probes – There are two gas monitoring probes located outside of the landfill along the gravel access track between the landfill and Stokes Valley. The methane concentration in these probes is monitored on a monthly frequency in compliance with condition 10 and condition 17. Geotechnics are engaged to carry out this monitoring on a monthly frequency.

Gas monitoring at the well heads – Condition 18 requires the following parameters to be measured and recorded at the gas well heads on a three-monthly frequency:

- Gas flow rate
- Gas composition (% methane, % oxygen, % carbon dioxide)
- Gas temperature
- Gas pressure
- Carbon monoxide (in ppm) if the residual nitrogen exceeds 15%
- Hydrogen sulphide
- Total non-methane organic components
- Ambient temperature and barometric pressure

Ambient temperature and barometric pressure are recorded at the local Silverstream weather station on at 15 minute intervals. The gas system operator (GSO) are responsible for managing the Silverstream gas field, and the monitoring and adjustment of the well heads. GSO are responsible for providing the monitoring data for the above parameters at a quarterly frequency.

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4.12.2 Gas management key performance indicators

KPIs have been developed for the following:

- Managing the expansion of the landfill:
  - Gas inhibitor management – maximising the time that the inhibitor is fully in place
  - Ring main continuity – minimising time that gas is extracted through only one end of the ring main.
  - Gas well connections – maximising the number of connections
  - Lifting and extending gas well casings
- Well field management:
  - Balancing the field to ensure that gas is extracted where it is being generated
  - Minimising condensate build-up.
- Gas plant operation – minimising downtime

The KPIs are reported on internally by LO, GSO , construction contractor, and the consultant on a monthly frequency as part of the monthly coordination meetings.

A summary of the monthly discussions will be included in each quarterly report for GWRC.

If the targets identified in the KPIs below cannot be met for more than two consecutive months, the issues will be raised with HCC for further discussion/action.

Key Performance Indicators			
Owner	**Action**	**Confirmation of execution**	**Target**
Gas inhibitor management			
Landfill Operator (LO)	Placement of gas inhibitor: Length of gas inhibitor placed this month	_____ m (total for the month)	Notification is sent when a length of 15 m to 30m is ready for gas inhibitor placement (Ref. NTC S121). Gas inhibitor shall be installed within one week of GSO installing the novacoil. Gas inhibitor should be capped with clay (Ref. NTC 124).
	Email comms sent to GSO and CC to notify that placement of gas inhibitor and novacoil can occur	Date of emails to GSO and CC:	
	New filling area: Total length of gas inhibitor pulled back for placing new refuse this month. Average length of gas inhibitor pulled back each day. Comment on time of day that gas inhibitor exposure occurred.	_____ m (total for the month) _____ m (daily average for the month) Comments:	Exposure of old refuse and old leachate gravels should be primarily undertaken during the morning, and in small increments each day (Ref. NTC S90).
Gas system operator (GSO)	Placement of novacoil:	_____ m (total for the month)	Novacoil shall be installed within one week of LO notifying

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Key Performance Indicators			
Owner	**Action**	**Confirmation of execution**	**Target**
	Total length of novacoil placed along gravels in preparation for installation of gas inhibitor. Confirm one week deadline from LO notification has been achieved or reasons why not met. Email notification of date of novacoil installation to CC.	_____ m (total length of new novacoil that can be connected) Comments (and date of email to CC):	that area is ready for gas inhibitor installation.
Construction Contractor (CC)	Exposing gas inhibitor for construction works: Total length of gas inhibitor exposed this month. Comment on date first cuts made, weather conditions, environmental controls used (builders plastic at end of each day, number of days that welding was carried out, etc).	_____ m (total for the month) Comments:	Any sections of gas inhibitor that are exposed for the purposes of construction work (e.g. welding new liner) should be covered over by the end of each working day. Environmental controls must be in place to minimise odour during works and overnight.
Ring main continuity			
LO/GSO/CC/ Engineering Consultant (EC)	Discuss sequencing programme and resourcing in each gas coordination meeting during construction season.	Discussion to be recorded in meeting minutes.	Minutes to be circulated confirming that sequence programme was discussed.
	Is ring main continuous? If not: Why not? How long has it been since it was last continuous? When will the ring main be continuous again? What upcoming programmed works will affect the ring main? (refer to sequencing plan).		Reconnection of both the eastern and western suction points on Stage 2 ring main as soon as possible, or within one month of confirmation that ring main can be connected. If agreed sequencing programme timeframes cannot be met, initiate fortnightly programme review meetings (actions to

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<table>
<tr><th colspan="4">Key Performance Indicators</th></tr>
<tr><th>Owner</th><th>Action</th><th>Confirmation of execution</th><th>Target</th></tr>
<tr><td></td><td colspan="2"></td><td>be recorded in Minutes).</td></tr>
<tr><td></td><td colspan="3">Comments:</td></tr>
<tr><td colspan="4">Gas well connections and maintenance</td></tr>
<tr><td>GSO</td><td>Number of Stage 2 wells disconnected and reconnected this month:</td><td>_____ number of new wells installed in Stage 2 this month

New well numbers:

Estimated connection date:
<table><tr><td>Well head number:</td><td>Length of time disconnected:</td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr></table></td><td rowspan="2">Refer to gas connection policy.
Gas wells to be reconnected by the end of each day where possible, otherwise temporary connections in the form of sacrificial wells or flow lines should be installed as soon as is practicable to maintain gas extraction from stage 2.
If disconnection of wells close to the active face is required this should be noted in monthly gas coordination meetings.</td></tr>
<tr><td></td><td>Comments on reasons for disconnections of gas wells lasting more than one day and plans for temporary connection.</td><td></td></tr>
<tr><td>LO</td><td>Well cap maintenance:
Compaction of the capping immediately around gas wells to be carried out each month either by hand-tamping or with a plate compactor.
Comment on number of wells with cracking that need more clay added around them.</td><td>Dates of weekly capping inspections:

Ad hoc based on T+T monthly gas emissions monitoring.
Well numbers for those wells that require new capping to be placed:
Comments:</td><td>Compaction around Stage 2 gas well heads (plate or hand-compaction) should be undertaken on a weekly frequency (Ref. NTC S100).</td></tr>
<tr><td>EC</td><td>Surface methane survey to be carried out fortnightly over Stage 2, and monthly over Stage 1.</td><td>Stage 2 survey dates:
1.
2.
Stage 1 survey dates:
1.
Summary memos sent out to LO/GSO/CC –</td><td>A fortnightly surface methane survey to be completed over Stage 2 and a monthly survey completed over Stage 1.</td></tr>
</table>

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Key Performance Indicators			
Owner	**Action**	**Confirmation of execution**	**Target**
Condensate management			
GSO	Identify areas across the landfill where surging of condensate is occurring in the collection pipelines near gas wells and the ring main. Condensate build up that cannot be addressed immediately to be reported monthly and responsibility for remediation to be shared between appropriate stakeholders.	Number of locations (by nearest well) where condensate/ surging was identified during the month. Monthly report shared between stakeholders? Comment on any additional works undertaken to manage condensate from monthly report.	Works to be conducted each month to identify condensate surging across the landfill and reported monthly. Work carried out to rectify condensate surging to be shared between responsible parties and discussed in each monthly gas coordination meeting.
Lifting of gas well casings			
LO	Comment on the wells that required lifting / casing extension this month. Provide a minimum 4 days notification to GSO.	Number of (and well head number) of wells requiring lifting this month: _____ Estimated date of re-connection of wells within/close to the active face: Well #: Date:	Provide a minimum of 4 days' notice to GSO that a gas well requires lifting.
GSO	Comment on well lifting process, any problems, modifications to method needed. GSO to re-connect gas wells (that had been too close to LO operations) within one week of LO making them available.	Comment on number of gas wells lifted and whether any problems occurred during lifting process: Confirm that wells that had been close to LO operations were connected within one week of LO notification that they are available for connection:	Gas well to be lifted within 4 days of LO notification. Lid to be replaced on top of the casing immediately. Re-compaction of capping around the base of the gas well (if well is not directly into refuse).
Well field management			
GSO	Stage 2: Weekly measurements of vacuum performance at locations along the exposed ring main.	Stage 2 monitoring dates this month: #1 – #2 – #3 – #4 –	Vacuum measurements to be recorded weekly and presented at the monthly gas coordination meetings.

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<table>
<tr><th colspan="6">Key Performance Indicators</th></tr>
<tr><th>Owner</th><th>Action</th><th colspan="3">Confirmation of execution</th><th>Target</th></tr>
<tr><td rowspan="3"></td><td>Monthly gas well readings.</td><td colspan="3"></td><td>Gas well readings to be recorded monthly.</td></tr>
<tr><td>Stage 1:
Monthly measurements of vacuum performance at locations along the exposed ring main.
Monthly gas well readings.</td><td colspan="3">Stage 1 monitoring dates this month:
#1 –

Email copies of field sheets to environmental consultant.</td><td>Vacuum measurements to be recorded monthly and presented at the monthly gas coordination meetings.

Gas well readings to be recorded monthly.</td></tr>
<tr><td colspan="4">Comments:</td></tr>
<tr><td colspan="6">Gas plant operation</td></tr>
<tr><td rowspan="6">GSO</td><td rowspan="6">Report on gas plant operations each month.

EC to email weekly average Stage 2 methane percentage and gas flow following each download from the Stage 2 logger.</td><td colspan="4">Total energy output February 19
• S1 runtime = ___ hours / downtime hours =
• S2 runtime = ___ hours / downtime hours =
• S3 runtime = ___ hours / downtime hours =
Remainder of time for each generator is on standby
Average: Suction (kPa) Methane % Oxygen %</td><td rowspan="6">Report on gas plant operation each month.</td></tr>
<tr><td>Week 1</td><td></td><td></td><td></td></tr>
<tr><td>Week 2</td><td></td><td></td><td></td></tr>
<tr><td>Week 3</td><td></td><td></td><td></td></tr>
<tr><td>Week 4</td><td></td><td></td><td></td></tr>
</table>

4.13 General nuisance control

Nuisances that can occur at landfill sites will be prevented by following sound landfilling practices including:

- The working face to be kept as small as possible (generally less than 30m wide).
- All refuse to be well compacted.
- All refuse to be promptly covered, at least on a daily basis.
- The site to be kept clean and tidy.

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4.14 Litter

4.14.1 Delivery

It will be a requirement for Landfill access that all loads with potential to generate litter must be covered.

4.14.2 Litter fences

The measures outlined in Section 4.13 shall be supplemented by the erection of movable screen fences immediately downwind of the working face and in any other places where windblown litter may eventuate.

Debris shall not be allowed to accumulate on the screens, which shall be cleared regularly. Screens shall be a minimum of 3 metres high with a mesh size no greater than 50mm. The site shall be regularly cleared of wind-blown litter, and in particular, after high wind events. All litter collected shall be disposed of at the working face.

A number of permanent litter fences have already been erected on-site. Additional fences will be erected if the need arises.

4.14.3 Litter patrols

Regular litter patrols will pick up litter. These patrols will cover the access road, landfill surface diversion drains, Tip Stream and all access tracks.

4.15 Dust

The following dust control measures are to be applied at all times:

- The extent of unvegetated areas is to be minimised.
- Haul roads and working face areas are to be watered, with tankers or fixed sprays.
- Vehicle speed restrictions are to be enforced.
- Approach roads and sealed surfaces within the site are to be swept as required.

4.16 Odour

Odours from Landfill operations can occur from time to time, although good site management will reduce these significantly. The main sources of odours on a Landfill site are:

- Gas generated from refuse decomposition.
- Highly putrescible loads of refuse.
- Excavation in old refuse.
- Leachate breakouts

The following specific steps will be taken:

- The generators of potentially odorous wastes will be required to deliver the waste prior to putrefaction, where possible, or to apply suitable odour suppressing chemicals to the load before delivery – loads not complying will be refused entry and only accepted after treatment.
- Wastes will be deposited and covered as soon as they arrive at the Landfill – potentially odorous loads will be typically required to be delivered prior to midday so that they are well covered with fresh refuse before completion of the day's operations.

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- Good compaction and the correct working face gradients will ensure that water ingress will be minimised. The removal or puncturing of intermediate cover shall be undertaken before placing waste in a new cell to ensure that impermeable lenses are not created within the landfill in order to minimise the occurrence of leachate breakouts.
- Any standing water near the working face will be drained to the leachate control system.
- A fixed odour neutralising spray unit has been installed on the toe bund.

All staff at the Landfill will receive training to identify odours and will be instructed to report all unusual, concentrated or significant odours on-site, so that measures may be taken to identify the source of the odour and eliminate it. The use of odour suppressant sprays will be considered if any odours occur beyond the site boundary.

4.17 Noise

The Landfill's design, construction and operating procedures incorporate measures specifically aimed at mitigating excessive noise impacts from the operation, and ensuring compliance with NZS6801:1991 Methods of Measuring Noise and NZS6802:1991 Assessment of Noise in the Environment. To achieve this, appropriate and well-maintained machinery will be used at the Landfill.

It has been shown that use of well-maintained machinery has a marked effect on noise and all machinery at the site will be regularly inspected and monitored to ensure that operation of faulty or inappropriate machinery is avoided. During construction periods, all contractors at the site will be required to use only machinery which ensures that work complies with the requirements of NZS6803P:1984.

4.18 Bird, flies and vermin control

The general measures as described in Section 4.13 are the most effective means of control for nuisances including birds, flies, and vermin, as they reduce access to the food source. Therefore, these methods will normally be adequate. However, in the event of a bird problem occurring, a programme of regular shooting of flare/noise guns will be undertaken.

4.19 Site facilities

All facilities over and above the office building required for staff during construction and operation of the Landfill are to be provided by the respective contractors. Facilities provided by contractors for their staff may be removed and new ones installed from time to time at the contractor's discretion.

The new and old office buildings are the property of the council, and will be maintained by the council as and when required.

4.19.1 Site security

Lockable gates are provided across the site access road. These gates are to be locked outside the hours of operation.

Security and key registers are to be maintained by the Landfill Manager with details of key issue to be recorded on a Security Register.

4.19.2 Signs

Appropriate information and warning signs shall be displayed around the site as required. These will either be standard temporary warning signs complying with NZTA standards or standard 1200 x 800mm safety warning signs.

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4.19.3 Hazardous materials

All fuel storage, chemical storage, fuelling and servicing of plant shall be carried out in designated areas. These areas shall be bunded to ensure that any fuel spills are contained within the bund.

4.19.4 Spillages

In the event of a spillage of any potentially hazardous material such as diesel or hydraulic oil, the spill shall be immediately contained using soil or clay. The Landfill Engineer shall be advised immediately, and arrangements made to collect the spill and any contaminated soil for treatment. Spill control kits will be located adjacent to all fuel storage areas.

4.20 Stormwater disposal

Open stormwater drains are located around and above the Landfill footprint area to intercept overland and upper catchment flows, these should be modified as the Landfill develops.

To divert surface water run-off away from an active area, temporary ditches and berms will be constructed. A temporary run-off control ditch that moves continuously ahead of the fill is to be used to separate rainfall which has directly contacted waste, from that which has contacted only clean soil.

Water which has come into contact with waste, is considered contaminated, and will be directed back into the landfill. Water which has only been in contact with soil materials will be considered uncontaminated and will be drained by gravity into the on-site surface drainage system, and thence to the sedimentation pond.

To mitigate against silt generation, the following measures are to be implemented:

- Disturbed earthworks areas will be minimised as far as practicable.
- Run-off will be controlled.
- Sediment will be retained.

Detailed construction drawings and specifications will be prepared for the construction of the drainage works for each of the stages.

Stormwater run-off from areas of waste with intermediate cover shall be directed to the stormwater drainage system by the use of drains that shall be constructed on the intermediate cover as part of the covering operation.

All surface water drains shall be regularly inspected and any deterioration, leakage or blockage rectified as soon as practicable to ensure they are maintained in good working order.

The Landfill Operator should remove accumulated silt from Sediment Retention Ponds and Decanting Earth Bunds as and when required to ensure the devices operate optimally, the material to be disposed-off in the Landfill.

4.20.1 Cut off drains

Surface water drains are constructed around the perimeter of the Landfill to intercept stormwater and other surface water (incl. any stream flow from the valleys above the landfill) that flows from the undeveloped higher sections of the Landfill site. The drains flow to piped sections at either end of the toe bund. From there the flow is directed into the settlement dam.

As the Landfill develops it will be necessary from time to time to redevelop the surface water cut-off drains to allow for the extension of the Landfill liner.

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Stormwater runoff from areas of the Landfill with final cover installed will also be directed to the surface water cut-off drains and settlement dam.

Cut-off drains are designed and constructed to minimise leakage through the invert into the surrounding soil.

4.20.2 Settling ponds

Two surface water settlement ponds have been constructed within the landfill boundary, one is located below the active tipping area and the other below the construction borrow area. These ponds accept all dirty surface water from these areas and treat the water prior to discharging into the stormwater system that flow into the settlement pond. The ponds allow coarse materials contained in the water to settle out prior to discharging into tip stream.

4.21 Drop-off facility

The drop-off facility will receive all refuse from cars, trailers, utes, vans and light trucks. These vehicles will reverse to the edge of the refuse pit where they will be unloaded into the refuse pit. The Landfill Manger will be responsible for ensuring the efficient operation of the drop-off facility. The tasks required to be undertaken by the Landfill Manger at the drop-off facility are listed in Table 4.

Table 4 – Drop-off facility operating tasks

Task	Description
Vehicle control	To ensure that traffic is controlled in an orderly fashion to maximise the capacity of the drop-off facility. In peak periods (weekends, spring & summer) a person may need to be allocated full time to marshalling cars.
Vetting refuse stream	The material being disposed of into the refuse pit is monitored and any suspicious material is inspected.
Keep car pad clear	The car pad is kept clear of an obstacles and swept on a regular basis.
Litter control	Litter in the vicinity of the drop-off facility is picked up on a regular basis.
Regular removal of refuse	Refuse from the drop-off facility will be removed on a regular basis to avoid potential nuisance problems such as odour or litter.
Scavenging	Scavenging of material from the refuse pit will not be allowed. The names or registration number of persistent scavengers will be reported to the Solid Waste Manager.

4.22 Resource Recovery and Recycling

The resource recovery and recycling area is to encourage the recovery of re-useable items which would otherwise have been disposed of in the Landfill. An area is also available for the disposal of white ware, particularly fridges and freezers for the extraction of CFC. Similarly, there is an area available for the disposal of car bodies. HCC has a relationship with Earth Care Ltd, a charitable organisation which encourages the diversion of recyclable bric-a-brac.

The tasks required to be undertaken by the Contractor at the resource recovery and recycling area are listed in Table 5. The operation of the resource recovery and recycling area may be undertaken by either the Landfill Manger or another contractor.

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Table 5 – Resource recovery and recycling area operating tasks

Task	Description
Access	Access to the recycling area will be kept to a high standard to ensure ease of access.
Ease of use	The recycling area should be easy for the public to use with the location of the receptacles clearly marked.
Removal of recyclables	The recycling receptacles should be emptied on a regular basis to ensure the materials are contained within the receptacles and not stored on the ground.
Litter control	Litter from around the recycling area is to be collected on a regular basis. The recycling area is to be kept tidy.
Waste oil	The waste oil recycling tank shall be contained within a bund to capture any spillages. The waste oil recycling tank shall be checked on a regular basis to ensure it is not overfilled.

4.23 Grounds and Infrastructure maintenance

The Landfill Operator shall maintain all Landfill facilities and infrastructure in good working order and in a neat and tidy condition. This shall include:

- Access roads,
- Signage,
- Surface water system and sediment dam
- Leachate drainage systems,
- Gas well compaction,
- Weighbridge and associated control system,
- Grassed and planted areas,
- Fences and gates and
- Final cover
- All other Landfill facilities and infrastructure.

Ground maintenance activities include:

- Mowing and/or weed eating of grass verges on access road and grassed areas on landfill surface
- Care of amenity planting areas
- Maintenance of access tracks to monitoring bores and along Tip Stream
- Maintenance of access road and other sealed areas.

The main areas requiring ongoing maintenance are summarised in Table 6.

Table 6 – Maintenance requirements

Task	Description	Minimum Frequency
Roads	Fill potholes, sweep (tar sealed) road	Six monthly
Road sides	Remove litter, mow, remove refuse from front gate	Quarterly
Drop-off Facility	Sweep turning area, remove litterD	Weekly
Stormwater Drains	Remove litter and slips; empty out sumps.	Monthly
Retention Pond	Remove litter	Weekly
	Remove silt	Every five years (due summer 2025/2026)

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Settling ponds, DEB, and Check dams	Remove silt as and when required to ensure there is sufficient storage capacity. A thorough clean to be completed during summer.	As required, preferably following big rain events
Leachate System	Clean out oil separator	Quarterly
Landfill Face	Keep drains clear, remove weeds & litter and mow.	Six-monthly

4.24 Monitoring and reporting

4.24.1 Waste

All waste entering the Landfill will be recorded in weighbridge system (i.e Weightrax or similar), a specialised software package that records the weight, type and the generator of the waste. A report of waste received and type will be prepared as part of the Landfill Operator's monthly contract claim.

In addition to weighbridge system data, a separate record of approvals to dispose of special wastes will be maintained (see Section 4.3 for the definition of special waste, and Section 4.4 for acceptance of special waste). The hardcopies of the special waste disposal documentation and the disposal dockets are held by T+T for a minimum period of three months.

Regular surveys of the composition of waste entering the landfill will be undertaken in accordance with MfE's Solid Waste Analysis Protocol.

A three-monthly report on waste tonnages and composition will be prepared by Landfill operator and included in the Quarterly monitoring report to GWRC.

The disposal location of all waste (including special waste) will be the active face, with the exception of asbestos special waste, which may be disposed of in the consented area in Stage 1 (WGN110202 [36380]). For the Stage 1 special waste disposal consent the recording requirements include the volume and nature of all special waste deposited in the designated area.

4.24.2 Surface water quality

4.24.2.1 Surface water monitoring locations and monitoring frequencies

Surface water monitoring sites are described in Table 7 and are shown on Figure 2 in Appendix B.

Table 8 contains a list of monitoring required under Stage 2 Consent WGN040184 [36288] Conditions 7, 8, 11 and 12.

Table 7 – Surface water monitoring location points

Site	Location
SW1A	Eastern drain culvert outlet before confluence with Tip Stream
SW2A	Western drain before confluence with SW1a and Tip Stream
SW3A	Tip Stream outlet from plunge pool
SW4	Tip Stream at landfill boundary

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Table 8 – Summary of surface water monitoring frequency

Item	Locations	Required under Stage 2 Consent
Surface water observations (colour, flow, foam, algae, odour) and conductivity	SW1A SW2A SW3A SW4	Weekdays by landfill operating staff and Monthly as part of routine sampling.
Surface water inspection	SW4	Monthly and following moderate to heavy rainfall events
Tip stream discharge rate	V-notch weir at SW3A	6 Monthly: Winter groundwater maximum (September) and summer groundwater minimum (April).
pH & conductivity (field) pH & conductivity (laboratory) Temperature (field) BOD5 Chloride Potassium Ammonical nitrogen Nitrate nitrogen Dissolved reactive phosphorous Total zinc Total boron Suspended solids Alkalinity g/m³ Total hardness g/m³ Iron mg/m³ Manganese mg/m³ Lead mg/m³ Chromium µg/L Arsenic µg/L	SW1A SW2A SW3A SW4	6 Monthly: Winter groundwater maximum (September) and summer groundwater minimum (April).
pH Temperature Conductivity Chloride Ammonia-N	SW1A SW2A (consented) SW3A (consented) SW4	Monthly, shall be completed on the same day each month, or same set time

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4.24.3 Grab samples

A grab sample shall be taken at the outlet of the sedimentation pond if the trigger levels for the monthly water quality monitoring exceed the trigger values, as per Condition 14 Resource Consent WGN040184 [36288]. The grab sample should be analysed for the following parameters, and reported to GWRC within two weeks:

- pH
- Conductivity
- Ammoniacal nitrogen
- Nitrate nitrogen
- Alkalinity
- Chloride
- Potassium
- Total organic carbon

4.24.4 Surface water sample collection methods

Conductivity measurements using a calibrated field meter and observations of SW1A, SW2A, SW3A, and SW4 are undertaken daily on weekdays by landfill staff. Conductivity measurements and observations (visual and olfactory) are recorded onto a pro-forma sheet (see Appendix E).

Prior to sampling for lab testing, surface water sites are tested using a calibrated field water quality meter. Temperature, pH, conductivity, dissolved oxygen and suspended solids are measured and recorded. Surface water samples are then collected by immersing the sample bottles into the stream channel.

Clean sampling containers are collected prior to sampling from the laboratory that are pre-labelled with a unique code and description. Care is taken when sampling into bottles containing a preservative to ensure the bottle is not overfilled. Clean disposable latex gloves are worn to prevent external contamination of the samples.

4.24.5 Groundwater quality

4.24.5.1 Monitoring locations and frequency

Groundwater water monitoring sites are described in Table 9 and are shown on Figure 2 in Appendix B. Table 10 contains a list of monitoring required under Stage 2 consent WNG970164 [33376] Conditions 15.

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Table 9 – Groundwater monitoring sites

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Table 10 – Summary of groundwater monitoring frequency

Item	Locations	Required under Stage 2 Consent
Groundwater levels	All sites listed in Table 2.3	Three monthly
pH and conductivity (field) Temperature (field) pH and Conductivity (laboratory) dissolved oxygen (field) Total organic carbon Alkalinity Sulphate Dissolved reactive phosphorus Chloride Sodium Potassium Calcium Magnesium Ammoniacal nitrogen Nitrate nitrogen Soluble boron Soluble zinc Silica	All sites listed in Table 2.3	6 Monthly: Winter groundwater maximum (September) and summer groundwater minimum (April).
SVOC VOC	All sites listed in Table 2.3	Annually to coincide with the summer groundwater minimum (April).

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4.24.6 Sample collection methods

A dip meter is used for measuring groundwater level. The dip meter is cleaned prior to dipping to prevent cross contamination between boreholes.

Each borehole contains its own Waterra pump that is connected to MDPE pipe. The Waterra pump is designed to sit approximately 500 mm above the bottom of the well. Where monitoring wells are over 8 m deep, an electric pump is used to bring groundwater to the surface.

Each borehole is initially pumped to purge free standing water and induce groundwater flow. A portable conductivity, pH and temperature meter is used to test the purged water. Purging is carried out until pH and conductivity is relatively consistent (an indication that groundwater flow has been induced). The values for pH and conductivity are recorded. The volume of water purged is also recorded. The purged water is stored on site in plastic containers and is emptied only after review of laboratory results has confirmed the water is not contaminated. After purging, groundwater samples are transferred directly into labelled clean bottles from the pump hose.

PFAS sampling shall be in accordance with the current version of the PFAS National Environmental Management Plan Version 2.0', Heads of EPA Australia and New Zealand.

4.24.7 Trigger values

For Stage 2 Discharge Consent WGN970164 [33376] Condition 18, trigger levels have been developed to detect potential leachate contamination in the landfill groundwater system.

Trigger levels are calculated as the mean plus or minus three standard deviations of baseline water quality data (based on a minimum of 4 sampling rounds over at least 12months) collected between 2005 and 2010. These values are provided in Appendix E. Responses to exceedances of trigger values are provided in Section 6.2.

4.24.8 Leachate

Leachate flow is recorded electronically daily from the leachate grit interceptor. Data have been collected from this location since September 1998.

The leachate monitoring location is at the outlet of the grease trap as shown on Figure 2. Leachate is collected directly from a V-notch weir housed in the leachate grit separator pond enclosure. Measurements of pH, conductivity, and temperature are undertaken monthly at this location using a calibrated field meter. An estimate of leachate flow is also made from a V-notch weir.

Leachate is tested every second month for the site's Trade Waste Permit (Jan, Mar, May, Jul, Sep, and Nov) ~~and annually in September for the Discharge Consent WGN 040184 [23258] Condition 13. Table 11 contains a list of analytes and monitoring frequency~~.

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Table 11 - Summary of leachate monitoring frequency

Trade waste consent (two monthly)	
pH	Copper
Conductivity	Lead
COD	Nickel
Arsenic	Zinc
Cadmium	Suspended solids
Chromium	

4.24.8.1 Trigger values

There are no numerical guidelines for leachate. The Consent requires there to be no increase in an analyte's concentration from the previous year. Analytes that increase in concentration from the previous year must be reported and may be required to be monitored more frequently.

4.24.8.2 Laboratory testing for water samples

All laboratory analysis is carried out by an IANZ accredited laboratory.

Water samples are delivered chilled to the laboratory the same day as sampling under chain of custody documentation. A copy of the chain of custody form is retained by T&T as proof of sample delivery.

Laboratory test results are usually available within 2 weeks of submitting samples. Laboratory turn-around may increase during 6 monthly and annual testing due to a greater number of analytes being tested.

PFAS sampling and testing shall be in accordance with the current version of the PFAS National Environmental Management Plan Version 2.0', Heads of EPA Australia and New Zealand.

4.24.9 Landfill gas

Monitoring of surface emissions at the site will be performed on a regular basis to identify the sources of fugitive emissions and odours. This will involve physically walking across the site and monitoring the Landfill surface with hand-held instruments and recording the findings. These periodic surveys will be carried out across the surface and around structures (e.g., well heads). Areas requiring corrective action will be identified on a site map and included in a field results summary issued to LO and GSO within one week of each surface methane survey.

The Consent also requires that the concentration of methane at the surface of the landfill areas that have intermediate or final cover shall not exceed 0.5% by volume. A compliance focussed survey is conducted following a set walk path to demonstrate compliance with this condition. A summary of these compliance focussed surveys is included in quarterly reporting.

A record will be maintained to document monitoring activities that are performed on the LFG recovery and utilisation system at the site. This operating record will include:

- Completed monitoring logs and summaries of field surveys.
- Copies of instrument calibration logs.

See Sections 4.12.1 and 4.12.2 for Silverstream landfill gas monitoring and reporting targets.

Stage 2 is eligible for a Unique Emissions Factor (UEF) under the Climate Change Regulations, and this is applied for on an annual basis. All landfill gas generated at Silverstream Landfill is destroyed by combustion at the electricity generation plant operated by GSO.

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As part of the UEF application a report is prepared annually. The report includes the following:

- A summary of the measured Stage 2 methane concentration and gas flow.
- Evaluation of the LFG data quality and monitoring frequency.
- A comparison of the waste quantities with those utilised for modelling, including revised modelling, if warranted.
- A comparison of the LFG recovery results with those predicted by modelling, including revised modelling, if warranted.

4.24.10 Operations

A system of daily, weekly and monthly monitoring of landfill operations will be established. The monitoring will cover the following:

- Refuse placement
- Air void calculations
- Compaction and void utilisation
- Cover activities
- Litter control
- Seagull management
- Customer service
- Kiosk operation
- Health and safety

The monitoring will be undertaken by both the Landfill Operator and the Engineer's representative to the operational contract. Reports will be made to Council on a monthly basis.

4.24.11 Climate

An automatic climate station has been established at the Landfill. The station records wind and rainfall data. A summary of the climate data from the landfill weather station is included in the quarterly reports.

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5 Contingency Planning

The purpose of contingency plans is to ensure that procedures are in place to deal with abnormal events. The principal objectives of contingency plans are:

- Ensure that potential contaminants are retained within the Landfill site.
- Ensure that injury to people is minimised.
- Ensure that damage to property is minimised.

Contingency Plans will be continuously developed to address potential risks associated with the Landfill operation. Where required, specific training of the Landfill staff will be completed.

All incidents that require the utilisation of the procedures in this section will be reported to the Council. Where specific reporting of exceedance of trigger levels or other monitoring parameters is required, these are detailed in the specific procedure.

The resource consent conditions for the Landfill require the LMP to identify emergency procedures in response to natural emergencies and hazardous waste spills. The type of events which have the potential to result in emergency action being required are as follows:

- Natural hazards
  - earthquakes
  - floods
  - landslides
  - extreme rainfall events
  - gale force winds
- Operational errors
- Failure of equipment and infrastructure (eg pipes).

This section identifies the potential result of an emergency event occurring and the action required. The potential outcomes of these emergency events are as follows:

- Leachate in surface waters
- Leachate in groundwater
- Fire
- Gas discharges
- Diesel in surface waters

The daily inspections of the Landfill and the daily and monthly monitoring will be the most likely trigger for alerting of an emergency event.

5.1 Leachate in surface waters

The most likely reason for leachate to appear in surface water is either an uncontrolled discharge from the landfill face or a leak or blockage in the leachate pipeline. The existence of leachate is most likely to be identified by the daily conductivity testing of surface waters or the daily inspection of the leachate system and Tip Stream.

If a daily conductivity reading exceeds the trigger value of 500 µs/m, an inspection shall be carried out to determine if contamination of the storm water system has occurred. A sample may be taken if deemed necessary and submitted to the laboratory for testing.

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An exceedance of conductivity trigger value at either the storm water pond inlet or outlet will trigger a investigation, once an exceedance is observed the Landfill Operator should notify the Engineering consultants that will conduct the investigation.

For a trigger level exceedance, the following actions shall be taken:

1 Immediately shut off the flow at the Retention pond outlet. This shall be done by raising the outlet valve.

2 Collect a grab sample at the outlet of the pond and arrange testing for:

- pH
- Conductivity
- Ammonia nitrogen
- Nitrate nitrogen
- Alkalinity
- Chloride
- Potassium
- Total organic carbon
    - Test results shall be reported to the Manager, Consent Management GWRC within 2 weeks of sampling.

3 Investigate the cause of the exceedance.

4 If contamination is found to persist:

- The stormwater system will be diverted into the trade waste sewer system until the cause of the trigger is evaluated and required remedial work is undertaken, or water quality has returned to concentrations below the trigger levels.
- Collect a sample at the outlet of the pond and test for the presence of PFAS compounds.

The action required in response to identification of the source of leachate entering surface waters is listed in Table 12.

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Table 12 – Response to leachate entering surface waters

Source	Action
Landfill face up stream of silt pond	1 Close silt pond outlet to Tip Stream 2 Commence pumping silt pond contents to leachate pipeline 3 Establish temporary works a) if source dispersed establish drains to collect leachate to central point and pipe to nearest leachate drain manhole b) if single source establish sump and pipe to nearest leachate drain manhole 4 Monitor to determine if all leachate has been captured 5 Cease pumping from silt ponds when leachate is no longer entering pond and pond has been emptied and cleaned if necessary 6 Undertake permanent works to capture and remove leachate
Leachate pipeline downstream of silt pond	1 Dam Tip Stream if low flow 2 Commence pumping Tip Stream to nearest leachate pipeline manhole 3 Establish temporary works a) if source dispersed establish drains to collect leachate to central point and pipe to nearest leachate drain manhole b) if single source such as pipe rupture or blockage pump leachate from upstream manhole to down stream manhole past problem area 4 Monitor to determine if all leachate has been captured 5 Cease pumping from Tip Stream and remove when leachate is no longer entering stream 6 Undertake permanent works to repair leachate pipeline 7 Investigate cause for leachate discharge and take remedial action as required.

5.2 Leachate in groundwater

The presence of leachate in the groundwater will be identified by the six-monthly groundwater monitoring as set out in Section 5. If the groundwater monitoring shows that contaminants in the groundwater are exceeding the values identified in the monitoring programme or there is a trend of increasing contamination, then action is required.

Laboratory reports are received as PDF email attachments. The reports are reviewed as soon as possible after they are received. Any trigger level exceedance shall be notified immediately (within 2 working days) by email to HCC and GWRC. Trigger levels have been developed for groundwater based on historical monitoring results. For a trigger level exceedance, the following actions shall be taken in accordance with the tiered investigations specified in consent WGN970164 [33376] condition 18:

1 If there is a concise explanation for the exceedance, this shall be provided in the initial notification (e.g. if a laboratory error has occurred).

2 Investigate the cause of the exceedance. The investigation will include comparison with nearby monitoring sites, evaluation of other contaminants, and review of conditions at the sample collection and potential for laboratory error to have contributed to the exceedance.

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3 If the exceedance is deemed to be significant, a follow up sample or samples shall be taken within 14 days of the exceedance being detected and tested for the analyte that exceeded the trigger level, plus PFAS compounds. If the exceedance is confirmed, GWRC shall be advised immediately. A report of follow up actions shall be provided with one month of the exceedance being confirmed.

4 Assess the significance of the exceedances in terms of the potential effect on ground water in the area and Tip Stream. This will include consideration of:

   a The magnitude of the exceedances in comparison with historical data.

   b The toxicity of the contaminant.

   c The mobility of the contaminant and the extent of attenuation between Tip Stream and the Hutt River.

   d Potential cumulative effects when combined with other contaminants.

5 Assess whether further monitoring is required. Depending on the type and significance of the exceedances, this may include one or more of the following:

   a Increased frequency of monitoring of the contaminant exceeding the trigger value.

   b Monitoring for additional contaminants.

   c Extending the monitoring network (e.g., additional groundwater or surface water monitoring).

6 Determine if further actions are required, including any changes to the existing stormwater or leachate system. The type of remedial work that would be undertaken will depend on the location and severity of the discharge. Potential types of remedial works include:

   a Construction of a cut off trench or grout curtain across the valley down steam of the Stage 2 landfill (as a barrier to leachate migration).

   b Exhumation and repair of damaged liner.

   c Installation of pumping wells to collect groundwater and either treat and discharge to the sewer, or re-circulate the groundwater.

7 Provide a report on the outcome of the investigation to Regional Council. This shall be provided within 1 month of the initial notification, unless otherwise agreed to with the Manager, Environmental Regulation, Wellington Regional Council.

5.3 Fire

In the event of a fire at the site, the following general actions shall be taken:

- Ensure all personnel are safe and clear of fire source/vicinity
- Notify Fire Service (dial 111)
- Notify the Principal (HCC), and the Engineer's Representative

The following specific actions shall be taken as required.

5.3.1 Fire in refuse haul vehicle

- Direct vehicle to a safe secluded area away from fill area (if possible)
- Use portable fire extinguisher from the vehicle if it is safe to do so
- Use site fire-fighting equipment to extinguish fire or to prevent spreading.

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5.3.2 Fire at on-site building

- Use portable fire extinguisher if it is safe to do so
- Use site fire fighting equipment to extinguish fire or to prevent spreading

5.3.3 Fire in Landfill

In the event of a fire in the Landfill, the following procedures shall be followed:

- Non-essential personnel vacated from vicinity of fire,
- Remove all plant and equipment from vicinity of fire (if possible),
  - Notify the gas plant about the fire, and if no gas extraction equipment is affected then keep the gas plant running to continue to maintain extraction of landfill gas.
- Close off all sources of air and landfill gas to the fire (if possible),
- Extinguish fire by covering with soil or sand,
- Quench the area with water and/or foam.

If all the above measures fail, then the area of the fire shall be progressively excavated and quenched accordingly. The NZ Fire Service will be in charge of controlling the fire once they are on site.

EXTREME CARE is required to fight landfill fires. The following points shall be noted when fighting refuse fires and all site personnel must be advised of these factors:

- Underground fires may spread in any direction beneath the surface and can appear on the surface at random
- The surface on which machines may be working can potentially be undermined by the fire
- As methane gas production is continuous and certain mixtures of methane and oxygen are highly flammable, previously extinguished areas of refuse can re-ignite
- The refuse can spontaneously ignite on exposure to air (spontaneous combustion through aerobic decomposition)

5.4 Gas discharges

Where there is evidence that gas odour is causing unacceptable off-site nuisance, the site shall be inspected and, if possible, the source of the odour shall be identified. Communication of the issue with the gas system operator shall be undertaken. Odour control shall be achieved by measures deemed appropriate by the Landfill Manger. These measures include:

- using masking agents as immediate and temporary solutions to temporary problems
- upgrading intermediate cover and/or capping
- using a portable gas detector to identify possible gas sources on and off site
- minimising or halting excavation work in the Landfill
- sealing off potential sources of landfill gas (e.g. leachate manholes, areas where gas "shimmers" can be seen, checking and replacing seal at vent well penetration of the final cover layer).

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5.5 Hazardous waste brought to or found on site

In the event that prohibited materials are brought to the site and/or found on the site, the following action shall be taken by the Landfill Manger:

- Advise staff and ensure all relevant safety procedures are followed
- Take steps to "isolate" the prohibited material from the general waste stream to ensure it does not get disposed of in the Landfill.

DO NOT HANDLE THE PROHIBITED WASTE

- Notify the transporter of the prohibited material to the site, if known to determine the producer of the material
- Determine the appropriate action required.
- Notify the Solid Waste Manager
- Solid Waste Manager to notify WRC if appropriate

EXTREME CARE is required in dealing with prohibited materials. All landfill personnel will be trained to recognise and constantly look for waste that could be potentially hazardous. Some hazardous waste tipoffs are:

- warning labels on containers, drums, buckets, cans, crates and boxes
- leaking loads, liquids of any kind
- sludges or semi-solids
- powders
- vacuum/tank trucks
- any container that could contain hazardous waste
- any loads with unusual or unfamiliar or incomplete paperwork
- any load with extreme odours
- any drum with both ends still intact

5.6 Earthquakes

Should any part of the Landfill be affected by a significant earthquake in the area, the following steps shall be taken by the Landfill Manager as soon as it is safe to do so:

- Account for all personnel and provide medical assistance as required
- Cease operation in the area
- Assess the extent of damage, if any
- Inspect stormwater and leachate systems and confirm they are operational
- Repair damage, if any
- Report the damage to the Principal (HCC) and the Engineer's Representative.

The contingency actions for leachate in surface waters or in groundwater resulting from an earthquake are the same as described in Sections 5.1 and 5.2.

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5.7 Road accident involving refuse vehicle

In the event of an on-site road accident involving refuse vehicles, the following steps shall be taken:

- Ensure safety of all personnel
- Call an Ambulance (Dial 111) if required
- Administer first aid if required
- Notify other emergency services if required
- Isolate the area involved (e.g. restrict unnecessary access by roping off, temporary signs, etc.)
- Landfill Manger will advise the Principal and the Engineer's Representative if appropriate.

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6 Aftercare

6.1 General

Aftercare activities include activities after the Landfill has ceased operation and is closed. Predominantly, these are maintenance of the cap and stormwater systems, maintenance of the leachate and LFG systems, monitoring, and landscaping works.

A new set of resource consents would be sought when the Landfill is due to close, to apply to the post-closure period.

This section of the LMP will cover each aspect of post-closure care and is intended to demonstrate what is envisaged in terms of post-closure as at the time of facility opening. It is expected that as operation of the Landfill progresses and further experience is gained with site conditions, requirements may change in respect of some aspects of post-closure care.

This post-closure component of the LMP provides a framework for maintenance, monitoring and reporting activities that will ensure proper engineering and environmental performance of the facility following the completion of landfilling and closing off of the final layer.

This plan for post-closure is based on the Landfill operating (i.e. receiving refuse) for approximately 50 years. Thus at the time of final closure, the bulk of the expected Landfill settlement and resulting cover maintenance requirements will have been completed.

Similarly, the bulk of the site landscaping and planting will have been established (some of it for in excess of 35 years). The bulk of the site will therefore be in a completed, established state, with routine maintenance of planting, drainage, roading and site amenities, having been undertaken for many years.

The overall scenario is thus one of a mature site, with the bulk of the landscaping, final cover and planting well established and self-sustaining. Leachate, gas and monitoring systems for the bulk of the site will be in routine operating mode. In the final area of landfilling, the final cover, and gas and leachate collection systems will be recently installed and will need to be subject to a higher level of maintenance immediately following closure. This requirement naturally defines and divides post-closure care into two categories, namely the intensive maintenance of the final Phase area (required for approximately the first 5 years), and the ongoing routine maintenance of the whole Landfill site and its environmental control measures.

6.2 Factors affecting aftercare

6.2.1 Settlement

A key aim of landfill cell construction will be to ensure that even settlement occurs. Settlement is a progressive process that commences immediately following placement of waste. Experience has shown that the bulk of the settlement occurs in the first 5 years following refuse placement and is generally complete (i.e. the Landfill becomes relatively stable dimensionally) after 10 years.

As part of the regular operation, settlement monitoring will be undertaken during landfilling, with the results to be used to predict settlement for the later, deeper phases. Settlement monitoring will consist of survey control from the Landfill perimeter to settlement monuments set in concrete on intermediate and/or final cover surfaces, as appropriate.

The drainage system as designed can cope with such settlement, as can the cover layer, provided the settlement is relatively even. Operations will need to take account of the need for even settlement when considering the final capping programme in any areas of deep landfilling, where a significant time interval occurs in the filling operation.

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Generally, differential effects due to uneven settlement are dealt with by adding additional topsoil locally, regrading and re-grassing as necessary. If differential settlement is too extensive either in area or in height to make this practical, then the affected areas of cap will need to be stripped of topsoil, regraded using additional cover, and then re-topsoiled and restored as necessary.

6.2.2 Leachate

The operating objective will be to minimise long-term leachate generation by providing a dense low permeability soil cap and maintaining the cap in a stable, vegetated, crack-free condition.

6.2.3 Landfill gas

Venting and extraction through the LFG collection system will control LFG pressures within the Landfill. This will ensure the slight positive pressures in the Landfill are controlled and will minimise the tendency for gas penetration of the cap material that could result in oxygen displacement and possibly plant die-off.

Given the expected low permeability of the cap materials, gas penetration is likely to be minimal. However, any "hotspots" showing evidence of gas penetration will need to be sub-excavated, gas control measures implemented, and a fresh layer of cover, growth medium and vegetation applied.

6.3 Final landform

6.3.1 Restoration procedure

The Landfill surface will be progressively restored as areas reach final level. This is to ensure that surface erosion is minimised and that vegetation is well established over the bulk of the Landfill surface by the time filling is complete.

In this way, rehabilitation becomes an integral part of the landfilling operation, and experience gained during the early phases can be applied to the forward planning of rehabilitation in subsequent areas. During operation, temporary faces and stockpiles will be grassed where these are to be left exposed for periods of three months or more.

It is intended that this landscaping programme will be progressively implemented throughout the Landfill life and at the point of final closure in the final Phase area, only minimal areas will remain where significant planting needs to be established.

The procedures required to successfully implement the landscaping and planting pattern will have been well tried and tested prior to final Landfill closure and it is expected that a continuation of these procedures will be able to be applied directly to the areas requiring planting and establishment of grass cover in the final Phase area.

6.3.2 Planting

Soil cover shall be checked once a year during initial restoration (for five years), to determine its depth, fertility, texture and condition by a soil scientist. Additional soil, fertiliser and compost will be applied if deemed necessary following this inspection.

Once all the planting surrounding the Landfill has been completed, the vegetation (trees, shrubs and wetland vegetation) shall be checked annually by the Landfill Engineer to ascertain the general condition of the plants, to identify those plants which are thriving, and to replace those plants which may have died or are not prospering. These shall be replaced with either the same variety of plant, or one that has proved itself more suited to the conditions.

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6.4 Cap maintenance

6.4.1 Cap protection

Rubber tyre rolling to seal the surface against erosion prior to placing the growth medium shall adequately protect completed areas of final cap. Prior to placing the growth medium, an activity that shall only be undertaken in stable weather condition, the final cover layer shall be lightly disced and contoured to hold the growth medium.

Following application of the growth medium and mulch mat, the surface shall be protected against cracking and desiccation by applying spray irrigation until grass growth is fully established.

The cap will be effectively maintained by re-applying topsoil and/or mulch mat in areas where soil loss occurs until fully established growth is achieved.

6.4.2 Cap drainage

Cap drainage will be established by contouring the final cover to form drainage swales. All cap drainage shall be carefully monitored and drainage swales maintained to mitigate the effects of:

- Uneven settlement (requiring adjustment of swale gradient/surface).
- Localised erosion (due to uneven grass strike for example).
- Cracking (due to settlement or desiccation).

In areas of drainage swale construction, final cap thickness shall be increased to 1-1.5m depending on location, to mitigate the effects of settlement induced cracking. In areas where experience shows drainage swales may be prone to erosion or de-vegetation, appropriate additional protection measures shall be implemented (e.g. riprap, matting or close turfing).

6.5 Maintenance of landfill facilities

Maintenance activities related to maintaining the facility grounds and surrounds, will be well established by the time final closure occurs. Generally, these activities will be subject to maintenance contracts. Maintenance activities will cover:

- Fences and gates
- Planted areas
- Grassed areas
- Leachate collection system
- Landfill gas collection system
- Roads and tracks
- Final cover layer
- Stormwater drains and sediment pond

6.6 Monitoring and reporting

During the aftercare period ongoing monitoring and reporting will continue. The nature of this monitoring has not been determined at this stage, but is likely to cover the following:

- Groundwater
- Surface water
- Landfill gas

RELEASED UNDER THE LOCAL GOVERNMENT AND MEETINGS ACT 1987

7 Applicability

This report has been prepared for the exclusive use of our client Hutt City Council, with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement.

Tonkin & Taylor Ltd

Report prepared by:

.....

s7(2)(a)

Civil Engineer

Authorised for Tonkin & Taylor Ltd by:

.....

s7(2)(a)

Project Director

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Appendix A Resource consents

RELEASED UNDER THE LOCAL GOVERNMENT AND MEETINGS ACT 1987

Quality for Life

22 JUN 2004

greater WELLINGTON
THE REGIONAL COUNCIL

Resource Consent

RESOURCE MANAGEMENT ACT 1991

RELEASED UNDER THE LOCAL GOVERNMENT AND MEETINGS ACT 1987

Consent No. WGN040184 [23248]

Category: Discharge permit

Pursuant to sections 104B, 105, 107 and 108, and subject to all the relevant provisions of the Resource Management Act 1991 and any regulations made thereunder, a consent in respect of a natural resource is hereby granted to:

Name	Hutt City Council
Address	30 Laings Road, Lower Hutt
Term of consent	Effective: 13 May 2004 — Expires: 13 May 2039
Purpose for which right is granted	To discharge waste, fugitive leachate and other site-generated liquid to land, in circumstances where contaminants may enter water.
Location	Silverstream Landfill is located immediately north of Stokes Valley, and is within the jurisdictional areas of Hutt City Council and the Greater Wellington Regional Council. This proposal is for the Stage 2 development of the existing landfill and is within the valley, immediately downstream of the existing landfill, at or about map reference NZMS 260:R27;775.035.
Legal description of land	Sec 204 and Part Sec 191, 194, 195 and 205 Hutt District, and Lots 1 and 4 DP 27329. Part Sec 742, Hutt District.
Volume/quantity/rate	N/A
Conditions	1-21 as attached

For and on behalf of
WELLINGTON REGIONAL COUNCIL

Manager, Consents Management

Date: .....

TELARC REGISTERED SUPPLIER

Summary of your rights and responsibilities

(Not part of the resource consent)

This resource consent gives you the right to use a public resource (e.g. water, air, the coastal marine area) in the manner specified in the consent.

You may exercise the resource consent how you see fit provided that you comply with all the conditions of your resource consent and all other laws of the land.

If you wish to change the way you operate under this resource consent or if you wish to alter or delete any consent conditions, please contact the Wellington Regional Council (hereafter referred to as Greater Wellington) prior to making the changes. You may need a formal variation to your resource consent conditions.

You may transfer your coastal, discharge, or water permit to any other person. So if you sell your operation please contact Greater Wellington and we will arrange the transfer. The service is free of charge.

If your resource consent application contained inaccurate or misleading information Greater Wellington may ask the Environment Court to cancel or alter the resource consent.

Your resource consent does not:

- provide any warranty of any structure or process;
- provide any guarantee that the resource will be available at all times;
- provide any right of access through or over public or private land;
- negate the need for any approvals necessary under other legislation.

You, as the holder(s) of this resource consent and your agents (including contractors and employees), are jointly and severally liable for compliance with the conditions of this consent. It's important that anyone operating on your behalf fully understands and complies with the conditions of the resource consent.

You are required to pay any relevant charges that are associated with the consent. Greater Wellington fixes these charges under section 36 of the Resource Management Act 1991. The Act allows you to comment on any proposed charges *prior to them being fixed*. Charges are usually fixed every three years. If you would like a copy of our current Resource Management Charging Policy please ask us.

You are required to allow Greater Wellington Enforcement Officers access to your site and operation at any reasonable time so that we can inspect your operation and confirm that it is complying with the resource consent.

Your resource consent will lapse if you do not exercise it within five years of the date it was granted (unless otherwise specified in the resource consent conditions). If this lapsing is going to be a problem for you please contact Greater Wellington before the lapse date.

If you stop using your resource consent for a continuous five-year period, Greater Wellington may cancel your resource consent. We will advise you in advance if we propose to cancel your consent. You also have the right to object to your consent being cancelled.

This consent is issued without prejudice to any claim that is lodged with the Waitangi Tribunal in relation to the customary ownership of natural resources, whether it be a claim that is pending hearing or whether it is a claim that is awaiting settlement by the Crown.

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Conditions to Resource Consent WGN040184 [23248]

General conditions

1. The location, design, implementation and operation of the discharge shall be generally as described in the resource consent application for Stage 2 development of the Silverstream Landfill and associated documents dated November 2003, except where amendments are required by conditions of these consents. In the event of differences or conflict between the measures described in the documents and the conditions, the conditions shall prevail.

2. The permit holder shall pass a copy of this consent and associated documents to any operator or contractor carrying out works permitted by this permit prior to the works commencing.

3. At least three months prior to commencing the landfilling activity, a Landfill Management Plan (LMP) shall be forwarded to the Manager, Consents Management, Wellington Regional Council for approval.

   The LMP shall provide details of the procedures to be put into place to operate the landfill in compliance with conditions of this permit and to minimise the potential for adverse effects due to the operation of the landfill. The LMP shall include, but not be limited to:

   - Description of the maintenance and development of the landfill;
   - Description of the monitoring programme and record keeping relating to this permit;
   - Description of hazardous waste acceptance criteria as specified in the "Guide to the Disposal of Wastes at Hutt City Council Landfills", dated May 1999 and methods of handling any unacceptable materials and the disposal of such material to an alternative facility;
   - The emergency procedures to be followed in the event of natural emergencies and hazardous waste spills;
   - The methods of controlling dust and odour emissions including the criteria for assessing when, and how regularly, roadways and the current landfill stages are dampened by water cart, or otherwise;
   - Methods for reducing fugitive dust and odour emissions during deposition of materials to the landfill face; and
   - Description of how landfill nuisances (including dust, litter, odour, noise, vermin, insects and birds) will be dealt with.

   The permit holder, by 1 October of each year, shall complete a review of the LMP to ensure that management practices result in compliance with the conditions of these consents. Proposed revisions shall be forwarded to the Manager, Consents Management, Wellington Regional Council for approval.

4. Landfill operations shall at all times be in accordance with the current provisions of the LMP.

5. The permit holder shall liase and work with the Silverstream Landfill Residents Liaison Group ('the Group') from the date of grant of this permit to develop a charter addressing issues as agreed between the Group and the permit holder. The permit holder shall report in writing to the Manager, Consents Management, Wellington Regional Council, annually as to the consultation and activities undertaken.

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6. The permit holder shall pay to Wellington Regional Council any administrative charge fixed in accordance with Section 36 of the Resource Management Act 1991, or any charge prescribed in accordance with regulations made under Section 36 of the Act.

7. Pursuant to Section 128 of the Resource Management Act 1991 the Wellington Regional Council may commence a review of any of the conditions of any of the consents, at any time within six months of the second, fifth, tenth, fifteenth, twenty-fifth and thirtieth anniversaries of the date of grant of this permit for any of the following purposes:

   - To deal with any actual or potential adverse effect on the environment which may arise from the exercise of the consent and which it is appropriate to deal with at a later stage; and/or
   - To review the adequacy of any plan prepared for this permit and incorporating any requirements into relevant conditions; and/or
   - To require additional monitoring to assess impacts, or specific action to be taken to mitigate demonstrated environmental impacts; and/or
   - To allow a reduction in the level of monitoring.

8. Not less than six months prior to the expiry or surrender of this consent, the permit holder shall apply for such consents as are required for either the closure or future management of the landfill.

9. The permit holder's interest in this permit may not be transferred to any owner or occupier of the site pursuant to Section 137 of the Resource Management Act 1991.

Specific conditions

10. Waste and any fugitive leachate and other site-generated liquid shall only be discharged onto, or into, land on those areas of the site identified as the Proposed Stage 2 Landfill Footprint (see drawing No. 2 "Landfill Catchment Topography" of the application).

11. No waste, other than Municipal Solid Waste (MSW), shall be accepted for disposal.

    Note: For the purposes of this permit, the definition of MSW shall be any non-hazardous, solid waste from a combination of domestic, commercial and industrial sources.

12. No liquid waste, other than site generated liquid waste, shall be accepted for disposal. The definition of liquid waste shall be any waste that has a solids content of less than 20%, except such waste that passes the Paint Filter Liquids Test (EPA Method 9095A).

13. Medical wastes shall be acceptable for disposal in accordance with NZS 4304:2002 "Health Care Waste Management".

14. Hazardous waste shall not be accepted for disposal at the Landfill.

    Note: For the purposes of this permit, the definition of "hazardous waste" shall be:

    (i) Any waste that:

    (a) contains hazardous substances at sufficient concentration to exceed the minimum degrees of hazard specified by Hazardous Substances (Minimum Degrees of Hazard) Regulations 2000 under the Hazardous Substances and New Organism Act 1996, or

    (b) Meets the definition for radioactive material included in the Radiation Protection Act 1965 and Regulations 1982.

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(ii) Wastes which exhibit the characteristics of toxicity and eco-toxicity which following testing using the US EPA Toxicity Characteristic Leaching Procedure (TCLP) result in leachable concentrations of contaminants in excess of the leachable concentration values in NSW EPA "TCLP Values for Solid Waste Landfills (1998)". Where NSW EPA TCLP values do not exist for a substance for which a disposal request is made, the TCLP limit shall be set at the lesser of:

(a) NZS 9201 Trade Waste Bylaw limits; or

(b) 100 times the New Zealand Drinking Water Standard (2000); or

(c) 1000 times the 95 percent level of protection trigger values for freshwater as listed in Table 3.4.1 of "Australian and New Zealand Guidelines for Fresh and Marine Water Quality" (ANZECC, 2000).

15. The permit holder shall maintain daily records of:

- The quantities and types of waste accepted at the landfill; and
- The actual location of the disposal of any special and odorous wastes.

A copy of this record shall be forwarded to the Manager, Consents Management, Wellington Regional Council by 1 October each year, unless otherwise agreed in writing by the Manager, Consents Management, Wellington Regional Council.

16. The permit holder shall monitor the volume of leachate withdrawn from the landfill and record this volume on a daily basis. This record shall be reported in writing to the Manager, Consents Management, Wellington Regional Council by 1 October each year, unless otherwise specified in writing by the Manager, Consents Management, Wellington Regional Council.

17. The permit holder shall, by the end of each working day, fully cover the refuse and waste at the landfill with suitable cover. Sufficient supplies of suitable cover material shall be stock piled on site at all times.

18. A final compacted soil capping layer of at least 1.5 metres shall be applied by the permit holder to each completed landfill stage.

19. The permit holder shall take all practicable measures to prevent windblown litter from leaving the active landfilling area. These measures shall include, but not be limited to, the use of movable screens.

20. The permit holder shall regularly monitor the landfill site for build-up of litter, paper and other deposits outside the active landfilling area, and remove any such material on a weekly basis.

21. The permit holder is to take effective precautions to ensure that refuse and dirt is not tracked or otherwise taken off the landfill site. The methods of controlling this shall be addressed in the LMP required under Condition 3 of this permit.

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Summary of your rights and responsibilities

(Not part of the resource consent)

This resource consent gives you the right to use a public resource (e.g. water, air, the coastal marine area) in the manner specified in the consent.

You may exercise the resource consent as you see fit provided that you comply with all the conditions of your resource consent and all other laws of the land.

If you wish to change the way you operate under this resource consent or if you wish to change or cancel any consent conditions, please contact the Greater Wellington Regional Council (GWRC) prior to making the changes. You may need a formal change to your resource consent conditions.

You may transfer your coastal, discharge, or water permit to any other person. If you sell your operation please contact GWRC and we will arrange the transfer for you (at no cost) once you've completed a 'Transfer of Permit' form including the signatures of the old and new owners.

If your resource consent application contained inaccurate or misleading information, GWRC may cancel or alter the resource consent.

Your resource consent does not:

- provide any warranty of any structure or process;
- provide any guarantee that the resource will be available at all times;
- provide any right of access through or over public or private land;
- negate the need for any approvals necessary under other legislation.

You as the holder(s) of this resource consent and your agents (including contractors and employees), are jointly and severally liable for compliance with the conditions of this consent. It is important that anyone operating on your behalf fully understands and complies with the conditions of the resource consent.

You are required to pay any relevant charges that are associated with the processing and monitoring of your consent under section 36 of the Resource Management Act 1991. Charges may be reviewed every year. If you would like a copy of our current Resource Management Charging Policy please ask us.

You have the right to object to the decision on your consent and/or any additional charges (over and above fixed charges) under section 357A and 357B of the Resource Management Act 1991. Such an objection should be made in writing, setting out the reasons, and be received by us within 15 working days of any decision on your consent and/or additional charges being notified to you.

You are required to allow GWRC Enforcement Officers access to your site and operation at any reasonable time so that we can inspect your operation and confirm that it is complying with your resource consent.

Your resource consent will lapse if you do not give effect to it within five years of the date it was granted (unless otherwise specified in the resource consent conditions). If you wish to apply for an extension of this lapse date please contact GWRC before the lapse date.

If you stop using your resource consent for a continuous five-year period, GWRC may cancel your resource consent. We will advise you in advance if we propose to cancel your consent. You have the right to object to your consent being cancelled.

This consent is issued without prejudice to any claim that is lodged with the Waitangi Tribunal in relation to the customary ownership of natural resources, whether it be a claim that is awaiting hearing or awaiting settlement by the Crown.

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Conditions to Resource Consent WGN040184 [33373]

General conditions

1. The location, design, implementation and operation of the discharge to air shall be generally as described in the resource consent application for Stage 2 development of the Silverstream Landfill and associated documents dated November 2003, except where amendments are required by conditions of these consents. In the event of differences or conflict between the measures described in the documents and the conditions, the conditions shall prevail.

2. The permit holder shall pay to Wellington Regional Council any administrative charge fixed in accordance with Section 36 of the Resource Management Act 1991, or any charge prescribed in accordance with regulations made under Section 36 of the Resource Management Act 1991.

3. Pursuant to Section 128 of the Resource Management Act 1991 the Wellington Regional Council may commence a review of any of the conditions of any of the consents at any time within six months of the second, fifth, tenth, fifteenth, twenty-fifth and thirtieth anniversaries of the date of grant of this permit for any of the following purposes:

   - To deal with any actual or potential adverse effect on the environment which may arise from the exercise of the consent and which it is appropriate to deal with at a later stage; and/or
   - To review the adequacy of any plan prepared for this permit and incorporating any requirements into relevant conditions; and/or
   - To require additional monitoring to assess impacts, or specific action to be taken to mitigate demonstrated environmental impacts; and/or
   - To allow a reduction in the level of monitoring.

4. Not less than six months prior to the expiry or surrender of this consent, the permit holder shall apply for such consents as are required for either the closure or future management of the landfill.

5. The permit holder's interest in this permit may not be transferred to any owner or occupier of the site pursuant to Section 137 of the Resource Management Act 1991.

Specific conditions

6. There shall be no discharges to air that are noxious, dangerous, offensive or objectionable at or beyond the legal boundary of the permit holder's property. These discharges include odour and dust.

Complaints and incidents

7. The permit holder shall keep a permanent record of any complaints received alleging adverse effects from the permit holder's operations. The complaints record shall contain the following where practicable:

   (a) the name and address of the complainant, if supplied;

   (b) identification of the nature of the complaint;

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(c) date and time of the complaint and alleged event;

(d) weather conditions at the time of the alleged event;

(e) results of the permit holder's investigations; and,

(f) any mitigation measures adopted.

The complaints record shall be made available to the Wellington Regional Council on request.

The permit holder shall notify the Manager, Consents Management, Wellington Regional Council, of any complaints received, which relate to the exercise of this permit, within 24 hours of being received, or on the next working day.

8. The permit holder shall keep a permanent record of any incident that could have caused or have caused adverse effects on the environment at or beyond the boundary or caused a breach of any condition of this resource consent.

The permit holder shall notify the Manager, Consents Management, Wellington Regional Council, of any incident within 24 hours of the incident being brought to the attention of the permit holder or on the next working day.
The permit holder shall forward an incident report to the Manager, Consents Management, Wellington Regional Council within seven working days of the incident occurring, unless otherwise agreed with the Manager, Consents Management, Wellington Regional Council.

Odour control

9. Refuse shall be covered with cleanfill or soil cover to a minimum depth of 150mm at the end of each working day. Alternative daily cover materials, such as tarpaulins, may be used in lieu of the clean fill or soil cover, with the approval in writing from the Manager, Consents Management, Wellington Regional Council. No refuse shall remain exposed overnight.

Gas management

10. The concentration of methane in monitoring probes outside the landfill footprint shall not exceed 5% by volume.

11. There shall be no visible emission, other than water vapour, light, heat haze, or steam, from any landfill gas flare.

12. The concentration of methane at the surface of landfill areas with intermediate or final cover shall not exceed 0.5% by volume.

13. The permit holder shall install a landfill gas extraction system in general accordance with drawings 50 ("Landfill Gas Extraction Well Layout") and 51 ("LFG System – Typical") and associated plans included in the consent application, dated November 2003.

14. All extraction wells shall be connected to the gas extraction system no later than 12 months after placing wastes within the radius of influence of the wells. Gas venting from the wells prior to connection to the gas extraction system may be burnt by passive flares.

15. Except as provided in Condition 14, all extracted landfill gas shall be combusted in a flare or generator. The gas collection and treatment system shall be restored as soon as practicable in the event of a malfunction, fault, or power outage.

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Monitoring and reporting

16. The permit holder shall undertake a weekly walkover site inspection. Any evidence of actual or potential landfill gas leaks, such as odour, cracks in the landfill surface, gas bubbles, leaks in the gas extraction system, or vegetation damage, shall be investigated. Where necessary remedial action shall be undertaken as soon as practicable to minimise fugitive gas discharges. Monitoring of surface emissions shall be carried out to demonstrate compliance with this condition on a quarterly basis.

17. Methane concentrations shall be measured and recorded on a monthly basis in each of the monitoring probes outside of the landfill footprint to demonstrate compliance with Condition 10.

18. Landfill gas shall be monitored at each extraction well head or, if more appropriate, at manifold points, on a three-monthly basis. The following parameters shall be measured and recorded:

    (a) gas flow rate;

    (b) gas composition (% methane, % oxygen, % carbon dioxide);

    (c) gas temperature;

    (d) ambient temperature;

    (e) gas pressure;

    (f) barometric pressure;

    (g) ppm carbon monoxide if residual nitrogen exceeds 15%;

    (h) hydrogen sulphide; and

    (i) total non-methane organic compounds.

19. The permit holder shall measure and record on-site weather conditions every 30 minutes. The parameters measured shall include:

    (a) wind velocity and direction;

    (b) barometric pressure;

    (c) rainfall; and

    (d) temperature.

20. The permit holder shall maintain a permanent log of all inspections, investigations and actions taken with respect to the landfill gas system.

21. If monitoring demonstrates that the methane gas concentration limit specified in Condition 12 is exceeded, then remedial action shall be carried out and the concentrations re-tested within 14 days. If this is not practicable, the permit holder shall prepare a programme of remedial action, including a timetable, within 14 days of the exceedance. The proposed programme shall be implemented within the proposed time period.

22. The permit holder shall provide sufficient on-site electrical generation, or other appropriate measures, to ensure the operation of landfill gas flare equipment is not interrupted for more than two hours through loss of mains power supply.

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Reporting

23.[1] The permit holder shall produce and submit a quarterly report, including the results from all monitoring required under this consent, and shall forward the report to the Manager, Consents Management, Wellington Regional Council by 30 April, 31 July, 31 October and 31 January each year.

24. The permit holder shall submit a monitoring and contingency plan to the Manager, Consents Management, Wellington Regional Council for approval one month prior to commencing monitoring. The plan shall:

- Set out responsibilities for carrying out the monitoring;
- Evaluate results; and
- Set out both groundwater and surface water response standards and contingency measures to be implemented should those standards be exceeded.

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[1] Condition 23 changed under S127 RMA on 24/04/17

Quality for Life

22 JUN 2004

greater WELLINGTON
THE REGIONAL COUNCIL

Resource Consent

RESOURCE MANAGEMENT ACT 1991

RELEASED UNDER THE LOCAL GOVERNMENT AND MEETINGS ACT 1987

Consent No. WGN040184 [23250]

Category: Water permit

Pursuant to sections 104B and 108, and subject to all the relevant provisions of the Resource Management Act 1991 and any regulations made thereunder, a consent in respect of a natural resource is hereby granted to:

Name	Hutt City Council
Address	30 Laings Road, Lower Hutt
Term of consent	Effective: 13 May 2004 — Expires: 13 May 2039
Purpose for which right is granted	To dam and divert Tip Stream for the purposes of creating a sedimentation pond.
Location	Silverstream Landfill is located immediately north of Stokes Valley, and is within the jurisdictional areas of Hutt City Council and the Greater Wellington Regional Council. This proposal is for the Stage 2 development of the existing landfill and is within the valley, immediately downstream of the existing landfill, at or about map reference NZMS 260:R27;775.035.
Legal description of land	Sec 204 and Part Sec 191, 194, 195 and 205 Hutt District, and Lots 1 and 4 DP 27329. Part Sec 742, Hutt District.
Volume/quantity/rate	N/A
Conditions	1-9 as attached

For and on behalf of
WELLINGTON REGIONAL COUNCIL

Manager, Consents Management

Date: .....

Summary of your rights and responsibilities

(Not part of the resource consent)

This resource consent gives you the right to use a public resource (e.g. water, air, the coastal marine area) in the manner specified in the consent.

You may exercise the resource consent how you see fit provided that you comply with all the conditions of your resource consent and all other laws of the land.

If you wish to change the way you operate under this resource consent or if you wish to alter or delete any consent conditions, please contact the Wellington Regional Council (hereafter referred to as Greater Wellington) prior to making the changes. You may need a formal variation to your resource consent conditions.

You may transfer your coastal, discharge, or water permit to any other person. So if you sell your operation please contact Greater Wellington and we will arrange the transfer. The service is free of charge.

If your resource consent application contained inaccurate or misleading information Greater Wellington may ask the Environment Court to cancel or alter the resource consent.

Your resource consent does not:

- provide any warranty of any structure or process;
- provide any guarantee that the resource will be available at all times;
- provide any right of access through or over public or private land;
- negate the need for any approvals necessary under other legislation.

You, as the holder(s) of this resource consent and your agents (including contractors and employees), are jointly and severally liable for compliance with the conditions of this consent. It's important that anyone operating on your behalf fully understands and complies with the conditions of the resource consent.

You are required to pay any relevant charges that are associated with the consent. Greater Wellington fixes these charges under section 36 of the Resource Management Act 1991. The Act allows you to comment on any proposed charges *prior to them being fixed*. Charges are usually fixed every three years. If you would like a copy of our current Resource Management Charging Policy please ask us.

You are required to allow Greater Wellington Enforcement Officers access to your site and operation at any reasonable time so that we can inspect your operation and confirm that it is complying with the resource consent.

Your resource consent will lapse if you do not exercise it within five years of the date it was granted (unless otherwise specified in the resource consent conditions). If this lapsing is going to be a problem for you please contact Greater Wellington before the lapse date.

If you stop using your resource consent for a continuous five-year period, Greater Wellington may cancel your resource consent. We will advise you in advance if we propose to cancel your consent. You also have the right to object to your consent being cancelled.

This consent is issued without prejudice to any claim that is lodged with the Waitangi Tribunal in relation to the customary ownership of natural resources, whether it be a claim that is pending hearing or whether it is a claim that is awaiting settlement by the Crown.

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Conditions to Resource Consent WGN040184 [23250]

General conditions

1. The location, design, implementation and operation of the dam and diversion shall be generally as described in the resource consent application for Stage 2 development of the Silverstream Landfill and associated documents dated November 2003, except where amendments are required by conditions of these consents. In the event of differences or conflict between the measures described in the documents and the conditions, the conditions shall prevail.

2. The permit holder shall pass a copy of this permit and associated documents to any operator or contractor carrying out works permitted by this permit prior to the works commencing.

3. The permit holder shall pay to Wellington Regional Council any administrative charge fixed in accordance with Section 36 of the Resource Management Act 1991, or any charge prescribed in accordance with regulations made under Section 36 of the Resource Management Act 1991.

4. Pursuant to Section 128 of the Resource Management Act 1991 the Wellington Regional Council may commence a review of any of the conditions of any of the consents, at any time within six months of the second, fifth, tenth, fifteenth, twenty-fifth and thirtieth anniversaries of the date of grant of this permit for any of the following purposes:

   - To deal with any actual or potential adverse effect on the environment which may arise from the exercise of the consent and which it is appropriate to deal with at a later stage; and/or
   - To review the adequacy of any plan prepared for this permit and incorporating any requirements into relevant conditions; and/or
   - To require additional monitoring to assess impacts, or specific action to be taken to mitigate demonstrated environmental impacts; and/or
   - To allow a reduction in the level of monitoring.
   - Not less than six months prior to the expiry or surrender of this consent, the permit holder shall apply for such consents as are required for either the closure or future management of the landfill.

Specific conditions

5. The Manager, Consents Management, Wellington Regional Council, shall be given a minimum of 48 hours notice prior to the works commencing.

Works/design conditions

6. Any erosion of the stream bank or bed that is attributable to the works carried out as part of this permit shall be repaired by the permit holder.

7. Diversion channels and cut-off drains shall be maintained to minimise the infiltration and run-off of stormwater onto the landfill from areas outside the landfill footprint.

8. All diverted stormwater shall be treated in the sedimentation pond as shown on Drawing 1 "Proposed Stage 2 Development" and Drawing 40 "Permanent Stormwater Drainage Catchment Plan", submitted as part of the application.

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9. The permit holder shall ensure that any fish that are stranded during construction and dewatering are immediately placed back in the active flowing channel. Dewatering is the process of the former area of active flowing channel losing water after the new channel begins to operate.

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Resource Consent

RESOURCE MANAGEMENT ACT 1991

Consent No. WGN040184 [36288]

Category: Discharge permit

Pursuant to sections 104B, 105, 107, 108 and 127, and subject to all the relevant provisions of the Resource Management Act 1991 and any regulations made thereunder, a consent in respect of a natural resource is hereby granted to:

Name	Hutt City Council		
Address	30 Laings Road, Lower Hutt		
Duration of consent	Effective: 13 May 2004	Variation: 2 August 2019	Expiry: 13 May 2039
Purpose for which right is granted	To discharge uncontaminated stormwater, groundwater and treated stormwater from a sedimentation pond to Tip Stream.		
Location	Silverstream Landfill is located immediately north of Stokes Valley, and is within the jurisdictional areas of Hutt City Council and the Greater Wellington Regional Council. This proposal is for the Stage 2 development of the existing landfill and is within the valley, immediately downstream of the existing landfill, at or about map reference NZTM 1767771.5441185		
Legal description of land	Sec 204 and Part Sec 191, 194, 195 and 205 Hutt District, and Lots 1 and 4 DP 27329. Part Sec 742, Hutt District		
Conditions	1-18 as attached		

For and on behalf of
WELLINGTON REGIONAL COUNCIL

s7(2)(a) [redacted]

.....
Team Leader, Environmental Regulation

Date: .....

RELEASED UNDER THE LOCAL GOVERNMENT AND MEETINGS ACT 1987

Summary of your rights and responsibilities

(Not part of the resource consent)

This resource consent gives you the right to use a public resource (e.g. water, air, the coastal marine area) in the manner specified in the consent.

You may exercise the resource consent as you see fit provided that you comply with all the conditions of your resource consent and all other laws of the land.

If you wish to change the way you operate under this resource consent or if you wish to change or cancel any consent conditions, please contact the Greater Wellington Regional Council (GWRC) prior to making the changes. You may need a formal change to your resource consent conditions.

You may transfer your coastal, discharge, or water permit to any other person. If you sell your operation please contact GWRC and we will arrange the transfer for you (at no cost) once you've completed a 'Transfer of Permit' form including the signatures of the old and new owners.

If your resource consent application contained inaccurate or misleading information, GWRC may cancel or alter the resource consent.

Your resource consent does not:

- provide any warranty of any structure or process;
- provide any guarantee that the resource will be available at all times;
- provide any right of access through or over public or private land;
- negate the need for any approvals necessary under other legislation.

You as the holder(s) of this resource consent and your agents (including contractors and employees), are jointly and severally liable for compliance with the conditions of this consent. It is important that anyone operating on your behalf fully understands and complies with the conditions of the resource consent.

You are required to pay any relevant charges that are associated with the processing and monitoring of your consent under section 36 of the Resource Management Act 1991. Charges may be reviewed every year. If you would like a copy of our current Resource Management Charging Policy please ask us.

You have the right to object to the decision on your consent and/or any additional charges (over and above fixed charges) under section 357A and 357B of the Resource Management Act 1991. Such an objection should be made in writing, setting out the reasons, and be received by us within 15 working days of any decision on your consent and/or additional charges being notified to you.

You are required to allow GWRC Enforcement Officers access to your site and operation at any reasonable time so that we can inspect your operation and confirm that it is complying with your resource consent.

Your resource consent will lapse if you do not give effect to it within five years of the date it was granted (unless otherwise specified in the resource consent conditions). If you wish to apply for an extension of this lapse date please contact GWRC before the lapse date.

If you stop using your resource consent for a continuous five-year period, GWRC may cancel your resource consent. We will advise you in advance if we propose to cancel your consent. You have the right to object to your consent being cancelled.

This consent is issued without prejudice to any claim that is lodged with the Waitangi Tribunal in relation to the customary ownership of natural resources, whether it be a claim that is awaiting hearing or awaiting settlement by the Crown.

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Conditions to Resource Consent WGN040184 [36288]

General conditions

1[1]. The location, design, implementation and operation of the discharge shall be generally as described in the resource consent application for Stage 2 development of the Silverstream Landfill and associated documents dated November 2003, except where amendments are required by conditions of these consents, including the change of conditions application lodged 5 June 2019. In the event of differences or conflict between the measures described in the documents, and the conditions, the conditions shall prevail.

2. The permit holder shall pass a copy of this permit and associated documents to any operator or contractor carrying out works permitted by this permit prior to the works commencing.

3. The permit holder shall pay to Wellington Regional Council any administrative charge fixed in accordance with Section 36 of the Resource Management Act 1991, or any charge prescribed in accordance with regulations made under Section 36 of the Resource Management Act 1991.

4. Pursuant to Section 128 of the Resource Management Act 1991 the Wellington Regional Council may commence a review of any of the conditions of any of the consents, at any time within six months of the second, fifth, tenth, fifteenth, twenty-fifth and thirtieth anniversaries of the date of grant of this permit for any of the following purposes:

   - To deal with any actual or potential adverse effect on the environment which may arise from the exercise of the consent and which it is appropriate to deal with at a later stage; and/or
   - To review the adequacy of any plan prepared for this permit and incorporating any requirements into relevant conditions; and/or
   - To require additional monitoring to assess impacts, or specific action to be taken to mitigate demonstrated environmental impacts; and/or
   - To allow a reduction in the level of monitoring.

5. Not less than six months prior to the expiry or surrender of this permit, the permit holder shall apply for such consents as are required for either the closure or future management of the landfill.

6. The permit holder's interest in this permit may not be transferred to any owner or occupier of the site pursuant to Section 137 of the Resource Management Act 1991.

Specific conditions

7. The discharge of stormwater from the sedimentation pond shall not result in any of the following effects in Tip Stream at or beyond the boundary of the landfill property:

   (a) The production of any conspicuous oil or grease films, scums or foams or floatable or suspended material;

   (b) Any conspicuous change in colour or visual clarity;

   (c) Any emissions of objectionable odour;

[1] Condition changed under s127 of the RMA on 2/8/2019

s7(2)(a)

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(d) The rendering of fresh water unsuitable for consumption by farm animals;

(e) Any significant adverse effect on aquatic life; and/or

(f) Any visible deposition of iron oxide.

Surface water monitoring

8. The permit holder shall carry out monthly inspections of Tip Stream below Silverstream Landfill and following moderate to heavy rainfall for compliance with Condition 7 of this consent.

9. All stormwater coming into contact with refuse shall be discharged into the leachate collection system and not into the sedimentation pond.

10. The permit holder shall place and maintain an appropriate sign near Tip Stream on the south-western boundary of the landfill to the satisfaction of the Manager, Consents Management, Wellington Regional Council. This sign shall:

(a) Provide clear identification of the location and nature of the discharge and advise that the stream is not suitable for contact recreation; and

(b) Be visible to the public visiting the area without unnecessarily detracting from the visual amenity of the area.

11[2]. The permit holder shall monitor water quality in Tip Stream at sampling locations to be approved by the Manager, Consents Management, Wellington Regional Council. The permit holder shall provide the sampling protocols to the Manager, Consents Management, Wellington Regional Council, at least one month before sampling commences. To this end, the permit holder shall monitor for the following parameters twice a year, to coincide with low flow during the winter groundwater level maximum (September) and summer groundwater minimum (April):

- estimate of flow
- pH (field and laboratory)
- conductivity (field and laboratory)
- BOD5
- Chloride
- Potassium
- ammoniacal nitrogen
- nitrate nitrogen
- dissolved reactive phosphorous
- potassium
- total zinc
- total boron
- Suspended solids
- Alkalinity g/m³
- Total hardness g/m³
- Iron mg/m³
- Manganese mg/m³
- Lead mg/m³
- Chromium µg/L
- Arsenic µg/L

Sampling shall be undertaken in accordance with protocols approved in writing by the Manager, Consents Management, Wellington Regional Council. The results of such monitoring shall be reported in writing to the Manager, Consents Management, Wellington Regional Council within two months of completion of the sampling.

s7(2)(a) [redacted]

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12.[3] The permit holder shall monitor water entering the sedimentation pond and water flowing from the pond outlet at a monthly frequency for the following parameters:

- pH
- Conductivity
- chloride; and
- ammonia-nitrogen
- temperature

Monthly monitoring shall be completed on the same day each month, or same set time.

The trigger levels set shall be supplied to the Manager, Consents Management, Greater Wellington Regional Council.

Note 1: For the purposes of this permit, trigger levels to indicate potential leachate contamination shall be set using the following:

- *pH - the mean plus or minus three standard deviations of baseline stormwater pH data from monthly monitoring of the Tip Stream surface water system prior to refuse deposition in Stage 2.*
- *Conductivity - the mean plus three standard deviations of baseline stormwater conductivity data from monthly monitoring of the Tip Stream surface water system prior to refuse deposition in Stage 2.*
- *Chloride– the mean plus three standard deviations of baseline stormwater conductivity data from monthly monitoring of the Tip Stream surface water system prior to refuse deposition in Stage 2 (2006 – 2009).*
- *Ammonia-nitrogen –the mean plus three standard deviations of baseline stormwater conductivity data from monthly monitoring of the Tip Stream surface water system prior to refuse deposition in Stage 2 (2006 – 2009).*

Note 2: It is important that sampling is taken consistently so that the water is sampled under a range of weather events. E.g. samples may be the first day each month, or the first Monday each month, as long as it is consistent.

13.[4] The sedimentation pond shall be configured such that in the case of contamination being detected at the outlet, the outflow can be stopped for conditions which do not result in flow over the auxiliary spillway, and shall include provision for pumping to enable contaminated stormwater to be re-circulated to the landfill or diverted to the leachate system for treatment as leachate.

14.[5] If the trigger levels for the monthly water quality monitoring parameters are exceeded, the permit holder shall take a grab sample of water from the sampling point at the outlet from the sedimentation pond, as shown on Drawing 46 “Stormwater Sedimentation Pond Layout” of the application and analyse this sample for the parameters listed below:

- pH
- Conductivity
- Ammoniacal nitrogen
- Nitrate nitrogen
- Alkalinity
- Chloride
- Potassium
- Total organic carbon

Sampling shall be undertaken in accordance with protocols to be approved by the Manager, Consents Management, Wellington Regional Council under condition 11 of this permit.

The results of the grab sample analysis shall be reported to the Manager, Consents Management, Wellington Regional Council within two weeks of sampling, unless otherwise agreed in writing by the Manager, Consents

[3] Condition changed under section 127 of the RMA on 2/8/2019

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s7(2)(a)

Management, Wellington Regional Council.

15. All water quality sample analyses required shall be undertaken using standard methods as detailed in the "Standard Methods for the Examination of Water and Waste Water 1998", twentieth edition by APHA and AWWA and WEF or by some other method approved in advance in writing by the Manager, Consents Management, Wellington Regional Council. A laboratory that is accredited to ISO/IEC Guide 25 for those specific tests shall carry out all testing.

16. If monitoring of the discharge system indicates leachate contamination, then the permit holder shall take immediate steps to prevent further leachate contamination and immediately report to the Manager, Consents Management, Wellington Regional Council on actions taken and further actions proposed to address leachate contamination.

Reporting

17.[6] The permit holder shall produce and submit a quarterly report, including the results from all monitoring required under this consent, and shall forward the report to the Manager, Consents Management, Wellington Regional Council by 30 April, 31 July, 31 October and 31 January each year.

18. The permit holder shall submit a monitoring and contingency plan to the Manager, Consents Management, Wellington Regional Council for approval one month prior to commencing monitoring. The plan shall:

- Set out responsibilities for carrying out the monitoring;
- Evaluate results; and
- Set out both groundwater and surface water response standards and contingency measures to be implemented should those standards be exceeded.

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s7(2)(a)

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Resource Consent

RESOURCE MANAGEMENT ACT 1991

RELEASED UNDER THE LOCAL GOVERNMENT AND MEETINGS ACT 1987

Consent No. WGN040184 [23253]

Category: Land use consent

Pursuant to sections 104B and 108, and subject to all the relevant provisions of the Resource Management Act 1991 and any regulations made thereunder, a consent in respect of a natural resource is hereby granted to:

Name	Hutt City Council
Address	30 Laings Road, Lower Hutt
Term of consent	Effective: 13 May 2004 — Expires: 13 May 2039
Purpose for which right is granted	To construct a sedimentation pond, dam, lined channel and drop structures in the bed of Tip Stream.
Location	Silverstream Landfill is located immediately north of Stokes Valley, and is within the jurisdictional areas of Hutt City Council and the Greater Wellington Regional Council. This proposal is for the Stage 2 development of the existing landfill and is within the valley, immediately downstream of the existing landfill, at or about map reference NZMS 260;R27;775.035.
Legal description of land	Sec 204 and Part Sec 191, 194, 195 and 205 Hutt District, and Lots 1 and 4 DP 27329. Part Sec 742, Hutt District.
Volume/quantity/rate	N/A
Conditions	1-15 as attached

For and on behalf of
WELLINGTON REGIONAL COUNCIL

Manager, Consents Management

Date: .....

telarc REGISTERED SUPPLIER

Summary of your rights and responsibilities

(Not part of the resource consent)

This resource consent gives you the right to use a public resource (e.g. water, air, the coastal marine area) in the manner specified in the consent.

You may exercise the resource consent how you see fit provided that you comply with all the conditions of your resource consent and all other laws of the land.

If you wish to change the way you operate under this resource consent or if you wish to alter or delete any consent conditions, please contact the Wellington Regional Council (hereafter referred to as Greater Wellington) prior to making the changes. You may need a formal variation to your resource consent conditions.

You may transfer your coastal, discharge, or water permit to any other person. So if you sell your operation please contact Greater Wellington and we will arrange the transfer. The service is free of charge.

If your resource consent application contained inaccurate or misleading information Greater Wellington may ask the Environment Court to cancel or alter the resource consent.

Your resource consent does not:

- provide any warranty of any structure or process;
- provide any guarantee that the resource will be available at all times;
- provide any right of access through or over public or private land;
- negate the need for any approvals necessary under other legislation.

You, as the holder(s) of this resource consent and your agents (including contractors and employees), are jointly and severally liable for compliance with the conditions of this consent. It's important that anyone operating on your behalf fully understands and complies with the conditions of the resource consent.

You are required to pay any relevant charges that are associated with the consent. Greater Wellington fixes these charges under section 36 of the Resource Management Act 1991. The Act allows you to comment on any proposed charges *prior to them being fixed*. Charges are usually fixed every three years. If you would like a copy of our current Resource Management Charging Policy please ask us.

You are required to allow Greater Wellington Enforcement Officers access to your site and operation at any reasonable time so that we can inspect your operation and confirm that it is complying with the resource consent.

Your resource consent will lapse if you do not exercise it within five years of the date it was granted (unless otherwise specified in the resource consent conditions). If this lapsing is going to be a problem for you please contact Greater Wellington before the lapse date.

If you stop using your resource consent for a continuous five-year period, Greater Wellington may cancel your resource consent. We will advise you in advance if we propose to cancel your consent. You also have the right to object to your consent being cancelled.

This consent is issued without prejudice to any claim that is lodged with the Waitangi Tribunal in relation to the customary ownership of natural resources, whether it be a claim that is pending hearing or whether it is a claim that is awaiting settlement by the Crown.

RELEASED UNDER THE LOCAL GOVERNMENT AND MEETINGS ACT 1987

Conditions to Resource Consent WGN040184 [23253]

General conditions

1. The location, design, implementation and operation of the Stage 2 development of the Silverstream Landfill shall be generally as described in the resource consent application and associated documents dated November 2003, except where amendments are required by conditions of these consents. In the event of differences or conflict between the measures described in the documents and the conditions, the conditions shall prevail.

2. Detailed designs of all 'principal' works shall be forwarded to the Manager, Consents Management, Wellington Regional Council at least ten working days prior to works commencing.

   Note: For the purposes of condition 2, 'principal' works means the sedimentation pond, the flow control structures, the dam, and the lined channel and drop structures.

3. The consent holder shall pass a copy of this consent and associated documents to any operator or contractor operating the landfill or carrying out works permitted by the consent on their behalf prior to the works commencing.

4. The consent holder shall pay to Wellington Regional Council any administrative charge fixed in accordance with Section 36 of the Resource Management Act 1991, or any charge prescribed in accordance with regulations made under Section 36 of the Resource Management Act 1991.

5. Pursuant to Section 128 of the Resource Management Act 1991 the Wellington Regional Council may commence a review of any of the conditions of any of the consents, at any time within six months of the second, fifth, tenth, fifteenth, twenty-fifth and thirtieth anniversaries of the date of grant of this permit for any of the following purposes:

   - To deal with any actual or potential adverse effect on the environment which may arise from the exercise of the consent and which it is appropriate to deal with at a later stage; and/or
   - To review the adequacy of any plan prepared for this permit and incorporating any requirements into relevant conditions; and/or
   - To require additional monitoring to assess impacts, or specific action to be taken to mitigate demonstrated environmental impacts; and/or
   - To allow a reduction in the level of monitoring.

6. Not less than six months prior to the expiry or surrender of this consent, the consent holder shall apply for such consents as are required for either the closure or future management of the landfill.

Specific conditions

7. The Manager, Consents Management, Wellington Regional Council, shall be given a minimum of 48 hours notice prior to the works commencing.

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Works/design conditions

8. All material used to construct the dam in Tip Stream shall be inert and have no potential to produce harmful effects on the environment.

9. A certificate signed by the person or persons (or suitably qualified person) responsible for designing the 'principal' works and structures, outlined in Condition 2, shall be submitted to the Manager, Consents Management, Wellington Regional Council within one month of completion of the works to certify that the works were carried out in accordance with the design plans submitted.

10. All practicable steps shall be taken to minimise sedimentation and turbidity in the stream, during the implementation, construction and operation of the works. These steps shall include, but not be limited to:

    - Separating construction activities from flowing water; and
    - Not cleaning, storing or refuelling machinery within 10 metres of the stream.

11. No contaminants (including but not limited to oil, petrol, diesel, hydraulic fluid) shall be released into water from equipment being used for the activity.

12. All works affecting the watercourse, including tidy-up on completion of the works shall be completed to the satisfaction of the Manager, Consents Management, Wellington Regional Council.

13. The works shall remain the responsibility of the consent holder and shall be maintained so that:

    - Any erosion of the stream bank or bed that is attributable to the works carried out as part of this consent is repaired by the consent holder;
    - The structural integrity of the structures remains sound; and
    - The batters of the dam structure shall be 'stabilised' against erosion within three months of completion of the structure.

    Note: For the purposes of Condition 13, 'stabilised' in relation to any site or area means inherently resistant to erosion or rendered resistant, such as by using indurated rock or by the application of basecourse, colluvium, grassing, mulch, or another method to the reasonable satisfaction of the Manager, Consents Management, Wellington Regional Council and as specified in Wellington Regional Council's "Erosion and Sediment Control Guidelines for the Wellington Region". Where seeding or grassing is used on a surface that is not otherwise resistant to erosion, the surface is considered stabilised once, on reasonable visual inspection by the Manager, Consents Management, Wellington Regional Council, an 80% vegetative cover has been established.

14. Scour protection works of concrete, rock or timber construction shall be placed at the outlet of the sedimentation pond to prevent scour.

15. If koiwi, taonga or other artefact material is discovered in any area during the works, the consent holder shall ensure that Te Runanganui o Taranaki Whanui ki te Upoko o te Ika a Maui and Wellington Tenths Trust are immediately contacted, and construction work in that area shall be stopped immediately to allow a site inspection by these groups and their advisors. The consent holder shall then consult with Te Runanganui o Taranaki Whanui ki te Upoko o te Ika a Maui and Wellington Tenths Trust on appropriate steps to recover the artefacts in order that work can resume.

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Resource Consent

RESOURCE MANAGEMENT ACT 1991

Consent No. WGN040184 [23254]

Category: Water permit

Pursuant to sections 104B and 108, and subject to all the relevant provisions of the Resource Management Act 1991 and any regulations made thereunder, a consent in respect of a natural resource is hereby granted to:

Name	Hutt City Council
Address	30 Laings Road, Lower Hutt
Term of consent	Effective: 13 May 2004 — Expires: 13 May 2039
Purpose for which right is granted	To divert ephemeral streams and existing drains to a sedimentation pond.
Location	Silverstream Landfill is located immediately north of Stokes Valley, and is within the jurisdictional areas of Hutt City Council and the Greater Wellington Regional Council. This proposal is for the Stage 2 development of the existing landfill and is within the valley, immediately downstream of the existing landfill, at or about map reference NZMS 260:R27;775.035.
Legal description of land	Sec 204 and Part Sec 191, 194, 195 and 205 Hutt District, and Lots 1 and 4 DP 27329. Part Sec 742, Hutt District.
Volume/quantity/rate	N/A
Conditions	1-11 as attached

For and on behalf of
WELLINGTON REGIONAL COUNCIL

Manager, Consents Management

Date: .....

RELEASED UNDER THE LOCAL GOVERNMENT AND MEETINGS ACT 1987

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Summary of your rights and responsibilities

(Not part of the resource consent)

This resource consent gives you the right to use a public resource (e.g. water, air, the coastal marine area) in the manner specified in the consent.

You may exercise the resource consent how you see fit provided that you comply with all the conditions of your resource consent and all other laws of the land.

If you wish to change the way you operate under this resource consent or if you wish to alter or delete any consent conditions, please contact the Wellington Regional Council (hereafter referred to as Greater Wellington) prior to making the changes. You may need a formal variation to your resource consent conditions.

You may transfer your coastal, discharge, or water permit to any other person. So if you sell your operation please contact Greater Wellington and we will arrange the transfer. The service is free of charge.

If your resource consent application contained inaccurate or misleading information Greater Wellington may ask the Environment Court to cancel or alter the resource consent.

Your resource consent does not:

- provide any warranty of any structure or process;
- provide any guarantee that the resource will be available at all times;
- provide any right of access through or over public or private land;
- negate the need for any approvals necessary under other legislation.

You, as the holder(s) of this resource consent and your agents (including contractors and employees), are jointly and severally liable for compliance with the conditions of this consent. It's important that anyone operating on your behalf fully understands and complies with the conditions of the resource consent.

You are required to pay any relevant charges that are associated with the consent. Greater Wellington fixes these charges under section 36 of the Resource Management Act 1991. The Act allows you to comment on any proposed charges *prior to them being fixed*. Charges are usually fixed every three years. If you would like a copy of our current Resource Management Charging Policy please ask us.

You are required to allow Greater Wellington Enforcement Officers access to your site and operation at any reasonable time so that we can inspect your operation and confirm that it is complying with the resource consent.

Your resource consent will lapse if you do not exercise it within five years of the date it was granted (unless otherwise specified in the resource consent conditions). If this lapsing is going to be a problem for you please contact Greater Wellington before the lapse date.

If you stop using your resource consent for a continuous five-year period, Greater Wellington may cancel your resource consent. We will advise you in advance if we propose to cancel your consent. You also have the right to object to your consent being cancelled.

This consent is issued without prejudice to any claim that is lodged with the Waitangi Tribunal in relation to the customary ownership of natural resources, whether it be a claim that is pending hearing or whether it is a claim that is awaiting settlement by the Crown.

RELEASED UNDER THE LOCAL GOVERNMENT AND MEETINGS ACT 1987

Conditions to Resource Consent WGN040184 [23254]

General conditions

1. The location, design, implementation and operation of the diversion shall be generally as described in the resource consent application Stage 2 development of the Silverstream Landfill and associated documents dated November 2003, except where amendments are required by conditions of these consents. In the event of differences or conflict between the measures described in the documents and the conditions, the conditions shall prevail.

2. The permit holder shall pass a copy of this consent and associated documents to any operator or contractor carrying out works permitted by this permit on their behalf prior to the works commencing.

3. The permit holder shall pay to Wellington Regional Council any administrative charge fixed in accordance with Section 36 of the Resource Management Act 1991, or any charge prescribed in accordance with regulations made under Section 36 of the Resource Management Act 1991.

4. Pursuant to Section 128 of the Resource Management Act 1991 the Wellington Regional Council may commence a review of any of the conditions of any of the consents, at any time within six months of the second, fifth, tenth, fifteenth, twenty-fifth and thirtieth anniversaries of the date of grant of this permit for any of the following purposes:

   - To deal with any actual or potential adverse effect on the environment which may arise from the exercise of the consent and which it is appropriate to deal with at a later stage; and/or
   - To review the adequacy of any plan prepared for this permit and incorporating any requirements into relevant conditions; and/or
   - To require additional monitoring to assess impacts, or specific action to be taken to mitigate demonstrated environmental impacts; and/or
   - To allow a reduction in the level of monitoring.

5. Not less than six months prior to the expiry or surrender of this consent, the permit holder shall apply for such consents as are required for either the closure or future management of the landfill.

Specific conditions

6. The Manager, Consents Management, Wellington Regional Council, shall be given a minimum of 48 hours notice prior to the works commencing.

Works/design conditions

7. All diversion channels shall be designed to manage a 1% Annual Exceedance Probability (AEP) design flood. The diversion channels shall be designed such that if this capacity is exceeded the preferential secondary flow path is away from the landfill.

8. Diversion channels and cut-off drains shall be designed and maintained to minimise the infiltration and run-off stormwater onto the landfill from areas outside the landfill footprint.

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9. All diverted stormwater shall be treated by the Sediment Pond as shown on Drawing 1 "Proposed Stage 2 Development" and Drawing 40 "Permanent Stormwater Drainage Catchment Plan", submitted as part of the application.

10. The consent permit holder shall ensure that any fish that are stranded during construction and dewatering are immediately placed back in the active flowing channel. Dewatering is the process of the former area of active flowing channel losing water after the new channel begins to operate.

11. The diversions shall remain the responsibility of the permit holder and shall be maintained to the satisfaction of the Manager, Consents Management, Wellington Regional Council.

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Resource Consent

RESOURCE MANAGEMENT ACT 1991

Consent No. WGN040184 [23256]

Category: Land use consent

Pursuant to sections 104B and 108, and subject to all the relevant provisions of the Resource Management Act 1991 and any regulations made thereunder, a consent in respect of a natural resource is hereby granted to:

Name	Hutt City Council
Address	30 Laings Road, Lower Hutt
Term of consent	Effective: 13 May 2004 / Expires: 13 May 2039
Purpose for which right is granted	To construct diversion structures in the beds of tributaries of Tip Stream for the purpose of stormwater management.
Location	Silverstream Landfill is located immediately north of Stokes Valley, and is within the jurisdictional areas of Hutt City Council and the Greater Wellington Regional Council. This proposal is for the Stage 2 development of the existing landfill and is within the valley, immediately downstream of the existing landfill, at or about map reference NZMS 260:R27;775.035.
Legal description of land	Sec 204 and Part Sec 191, 194, 195 and 205 Hutt District, and Lots 1 and 4 DP 27329. Part Sec 742, Hutt District.
Volume/quantity/rate	N/A
Conditions	1-17 as attached

For and on behalf of
WELLINGTON REGIONAL COUNCIL

Manager, Consents Management

Date: .....

RELEASED UNDER THE LOCAL GOVERNMENT AND MEETINGS ACT 1987

TEAORC REGISTERED SUPPLIER

Summary of your rights and responsibilities

(Not part of the resource consent)

This resource consent gives you the right to use a public resource (e.g. water, air, the coastal marine area) in the manner specified in the consent.

You may exercise the resource consent how you see fit provided that you comply with all the conditions of your resource consent and all other laws of the land.

If you wish to change the way you operate under this resource consent or if you wish to alter or delete any consent conditions, please contact the Wellington Regional Council (hereafter referred to as Greater Wellington) prior to making the changes. You may need a formal variation to your resource consent conditions.

You may transfer your coastal, discharge, or water permit to any other person. So if you sell your operation please contact Greater Wellington and we will arrange the transfer. The service is free of charge.

If your resource consent application contained inaccurate or misleading information Greater Wellington may ask the Environment Court to cancel or alter the resource consent.

Your resource consent does not:

- provide any warranty of any structure or process;
- provide any guarantee that the resource will be available at all times;
- provide any right of access through or over public or private land;
- negate the need for any approvals necessary under other legislation.

You, as the holder(s) of this resource consent and your agents (including contractors and employees), are jointly and severally liable for compliance with the conditions of this consent. It's important that anyone operating on your behalf fully understands and complies with the conditions of the resource consent.

You are required to pay any relevant charges that are associated with the consent. Greater Wellington fixes these charges under section 36 of the Resource Management Act 1991. The Act allows you to comment on any proposed charges *prior to them being fixed*. Charges are usually fixed every three years. If you would like a copy of our current Resource Management Charging Policy please ask us.

You are required to allow Greater Wellington Enforcement Officers access to your site and operation at any reasonable time so that we can inspect your operation and confirm that it is complying with the resource consent.

Your resource consent will lapse if you do not exercise it within five years of the date it was granted (unless otherwise specified in the resource consent conditions). If this lapsing is going to be a problem for you please contact Greater Wellington before the lapse date.

If you stop using your resource consent for a continuous five-year period, Greater Wellington may cancel your resource consent. We will advise you in advance if we propose to cancel your consent. You also have the right to object to your consent being cancelled.

This consent is issued without prejudice to any claim that is lodged with the Waitangi Tribunal in relation to the customary ownership of natural resources, whether it be a claim that is pending hearing or whether it is a claim that is awaiting settlement by the Crown.

RELEASED UNDER THE LOCAL GOVERNMENT AND MEETINGS ACT 1987

Conditions to Resource Consent WGN040184 [23256]

1. The location, design, implementation and operation of the Stage 2 development of the Silverstream Landfill shall be generally as described in the resource consent application and associated documents dated November 2003, except where amendments are required by conditions of these consents. In the event of differences or conflict between the measures described in the documents and the conditions, the conditions shall prevail.

2. Detailed designs of all 'principal' works shall be forwarded to the Manager, Consents Management, Wellington Regional Council at least ten working days prior to works commencing.

   Note: For the purposes of Condition 2, 'principal' works means the diversion structures to be placed in riverbeds of tributaries of Tip Stream for the purpose of stormwater management.

3. The consent holder shall pass a copy of this consent and associated documents to any operator or contractor operating the landfill or carrying out works permitted by the consent on their behalf prior to the works commencing.

4. The consent holder shall pay to Wellington Regional Council any administrative charge fixed in accordance with Section 36 of the Resource Management Act 1991, or any charge prescribed in accordance with regulations made under Section 36 of the Resource Management Act 1991.

5. Pursuant to Section 128 of the Resource Management Act 1991 the Wellington Regional Council may commence a review of any of the conditions of any of the consents, at any time within six months of the second, fifth, tenth, fifteenth, twenty-fifth and thirtieth anniversaries of the date of grant of this permit for any of the following purposes:

   - To deal with any actual or potential adverse effect on the environment which may arise from the exercise of the consent and which it is appropriate to deal with at a later stage; and/or
   - To review the adequacy of any plan prepared for this permit and incorporating any requirements into relevant conditions; and/or
   - To require additional monitoring to assess impacts, or specific action to be taken to mitigate demonstrated environmental impacts; and/or
   - To allow a reduction in the level of monitoring.

6. Not less than six months prior to the expiry or surrender of this consent, the consent holder shall apply for such consents as are required for either the closure or future management of the landfill.

Specific conditions

7. The consent holder shall take all practicable steps to minimise sedimentation and turbidity of the tributaries due to the works. These steps shall include, but not be limited to, carrying out the works during low flows, and diverting the stream flow around the works area during works in the stream.

8. All machinery shall be well maintained at all times to prevent leakage or spill of oil or other chemicals into the tributary.

9. No machinery shall be cleaned, stored or refuelled within ten metres of the tributary.

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10. Diversion channels shall be designed such that if this capacity is exceeded the preferential secondary flow path is, as far as practicable, away from the landfill.

11. Diversion channels and cut-off drains shall be maintained to minimise the infiltration and run-off of stormwater onto the landfill from areas outside the landfill footprint.

12. The consent holder shall ensure that any fish that are stranded during dewatering of the section of the streambed being diverted are immediately placed back in the active flowing channel.

13. The works shall remain the responsibility of the consent holder and shall be maintained so that any erosion or scour attributable to the works is minimised and repaired.

14. If koiwi, taonga or other artefact material is discovered in any area during the works, the consent holder shall ensure that Te Runanganui o Taranaki Whanui ki te Upoko o te Ika a Maui and Wellington Tenths Trust are immediately contacted, and construction work in that area shall be stopped immediately to allow a site inspection by these groups and their advisors. The consent holder shall then consult with Te Runanganui o Taranaki Whanui ki te Upoko o te Ika a Maui and Wellington Tenths Trust on appropriate steps to recover the artefacts in order that work can resume.

15. All works affecting the stream including tidy-up on completion of the works shall be to the satisfaction of the Manager, Consents Management, Wellington Regional Council.

16. Suitable scour protection of concrete, rock or timber construction shall be placed at the inlet and outlet of any channels and, if required, at intermediate locations.

17. Any sediment control measures used shall be constructed and carried out in accordance with the "Erosion and Sediment Control Guidelines for the Wellington Region", dated September 2002.

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Resource Consent

RESOURCE MANAGEMENT ACT 1991

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Consent No. WGN040184 [23259]

Category: Land use consent

Pursuant to sections 104C and 108, and subject to all the relevant provisions of the Resource Management Act 1991 and any regulations made thereunder, a consent in respect of a natural resource is hereby granted to:

Name	Hutt City Council
Address	30 Laings Road, Lower Hutt
Term of consent	Effective: 13 May 2004 — Expires: 13 May 2039
Purpose for which right is granted	To undertake earthworks associated with the formation of roads and tracks.
Location	Silverstream Landfill is located immediately north of Stokes Valley, and is within the jurisdictional areas of Hutt City Council and the Greater Wellington Regional Council. This proposal is for the Stage 2 development of the existing landfill and is within the valley, immediately downstream of the existing landfill, at or about map reference NZMS 260:R27;775.035.
Legal description of land	Sec 204 and Part Sec 191, 194, 195 and 205 Hutt District, and Lots 1 and 4 DP 27329. Part Sec 742, Hutt District.
Volume/quantity/rate	N/A
Conditions	1-11 as attached

For and on behalf of
WELLINGTON REGIONAL COUNCIL

Manager, Consents Management

Date: .....

TELARC REGISTERED SUPPLIER

Summary of your rights and responsibilities

(Not part of the resource consent)

This resource consent gives you the right to use a public resource (e.g. water, air, the coastal marine area) in the manner specified in the consent.

You may exercise the resource consent how you see fit provided that you comply with all the conditions of your resource consent and all other laws of the land.

If you wish to change the way you operate under this resource consent or if you wish to alter or delete any consent conditions, please contact the Wellington Regional Council (hereafter referred to as Greater Wellington) prior to making the changes. You may need a formal variation to your resource consent conditions.

You may transfer your coastal, discharge, or water permit to any other person. So if you sell your operation please contact Greater Wellington and we will arrange the transfer. The service is free of charge.

If your resource consent application contained inaccurate or misleading information Greater Wellington may ask the Environment Court to cancel or alter the resource consent.

Your resource consent does not:

- provide any warranty of any structure or process;
- provide any guarantee that the resource will be available at all times;
- provide any right of access through or over public or private land;
- negate the need for any approvals necessary under other legislation.

You, as the holder(s) of this resource consent and your agents (including contractors and employees), are jointly and severally liable for compliance with the conditions of this consent. It's important that anyone operating on your behalf fully understands and complies with the conditions of the resource consent.

You are required to pay any relevant charges that are associated with the consent. Greater Wellington fixes these charges under section 36 of the Resource Management Act 1991. The Act allows you to comment on any proposed charges *prior to them being fixed*. Charges are usually fixed every three years. If you would like a copy of our current Resource Management Charging Policy please ask us.

You are required to allow Greater Wellington Enforcement Officers access to your site and operation at any reasonable time so that we can inspect your operation and confirm that it is complying with the resource consent.

Your resource consent will lapse if you do not exercise it within five years of the date it was granted (unless otherwise specified in the resource consent conditions). If this lapsing is going to be a problem for you please contact Greater Wellington before the lapse date.

If you stop using your resource consent for a continuous five-year period, Greater Wellington may cancel your resource consent. We will advise you in advance if we propose to cancel your consent. You also have the right to object to your consent being cancelled.

This consent is issued without prejudice to any claim that is lodged with the Waitangi Tribunal in relation to the customary ownership of natural resources, whether it be a claim that is pending hearing or whether it is a claim that is awaiting settlement by the Crown.

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Conditions to Resource Consent WGN040184 [23259]

General conditions

1. The location, design, implementation and operation of the Stage 2 development of the Silverstream Landfill shall be generally as described in the resource consent application and associated documents dated November 2003, except where amendments are required by conditions of these consents. In the event of differences or conflict between the measures described in the documents and the conditions, the conditions shall prevail.

2. The consent holder shall pass a copy of this consent and associated documents to any operator or contractor operating the Landfill or carrying out works permitted by the consent on their behalf prior to the works commencing.

3. The consent holder shall pay to Wellington Regional Council any administrative charge fixed in accordance with Section 36 of the Resource Management Act 1991, or any charge prescribed in accordance with regulations made under Section 36 of the Resource Management Act 1991.

4. Pursuant to Section 128 of the Resource Management Act 1991 the Wellington Regional Council may commence a review of any of the conditions of any of the consents, at any time within six months of the second, fifth, tenth, fifteenth, twenty-fifth and thirtieth anniversaries of the date of grant of this permit for any of the following purposes:

   - To deal with any actual or potential adverse effect on the environment which may arise from the exercise of the consent and which it is appropriate to deal with at a later stage; and/or
   - To review the adequacy of any plan prepared for this permit and incorporating any requirements into relevant conditions; and/or
   - To require additional monitoring to assess impacts, or specific action to be taken to mitigate demonstrated environmental impacts; and/or
   - To allow a reduction in the level of monitoring.

5. Not less than six months prior to the expiry or surrender of this consent, the consent holder shall apply for such consents as are required for either the closure or future management of the landfill.

Specific conditions

6. The Manager, Consents Management, Wellington Regional Council, shall be given a minimum of 48 hours notice prior to the works commencing.

7. Earthworks shall be constructed and carried out in accordance with the principles contained within the "Erosion and Sediment Control Guidelines for the Wellington Region", dated September 2002.

8. If koiwi, taonga or other artefact material is discovered in any area during the works, the consent holder shall ensure that Te Runanganui o Taranaki Whanui ki te Upoko o te Ika a Maui and Wellington Tenths Trust are immediately contacted, and construction work in that area shall be stopped immediately to allow a site inspection by these groups and their advisors. The consent holder shall then consult Te Runanganui o Taranaki Whanui ki te Upoko o te Ika a Maui and Wellington Tenths Trust on appropriate steps to recover the artefacts in order that work can resume.

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9. The consent holder shall take all practicable steps to ensure that the works do not result in vegetation, soil, slash or other debris entering any surface water body.

10. All construction works shall be 'stabilised' in the minimum time practicable.

Note: For the purposes of Condition 10, 'stabilised' in relation to any site or area means inherently resistant to erosion or rendered resistant, such as by using indurated rock or by the application of basecourse, colluvium, grassing, mulch, or another method to the reasonable satisfaction of the Manager, Consents Management, Wellington Regional Council and as specified in the Wellington Regional Council's "Erosion and Sediment Control Guidelines for the Wellington Region", dated September 2002. Where seeding or grassing is used on a surface that is not otherwise resistant to erosion, the surface is considered stabilised once, on reasonable visual inspection by the Manager, Consents Management, Wellington Regional Council, an 80% vegetative cover has been established.

11. The works shall remain the responsibility of the consent holder and shall be maintained to minimise effect on slope stability, erosion and sedimentation to the satisfaction of the Manager, Consents Management, Wellington Regional Council.

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Resource Consent

RESOURCE MANAGEMENT ACT 1991

Consent No. WGN040184 [23260]

Category: Land use consent

Pursuant to sections 104C and 108, and subject to all the relevant provisions of the Resource Management Act 1991 and any regulations made thereunder, a consent in respect of a natural resource is hereby granted to:

Name	Hutt City Council
Address	30 Laings Road, Lower Hutt
Term of consent	Effective: 13 May 2004 — Expires: 13 May 2039
Purpose for which right is granted	To excavate the floor and side slopes of the landfill and to operate borrow areas for the supply of construction and cover materials.
Location	Silverstream Landfill is located immediately north of Stokes Valley, and is within the jurisdictional areas of Hutt City Council and the Greater Wellington Regional Council. This proposal is for the Stage 2 development of the existing landfill and is within the valley, immediately downstream of the existing landfill, at or about map reference NZMS 260:R27;775.035.
Legal description of land	Sec 204 and Part Sec 191, 194, 195 and 205 Hutt District, and Lots 1 and 4 DP 27329. Part Sec 742, Hutt District.
Volume/quantity/rate	N/A
Conditions	1-11 as attached

For and on behalf of
WELLINGTON REGIONAL COUNCIL

Manager, Consents Management

Date: .....

RELEASED UNDER THE LOCAL GOVERNMENT AND MEETINGS ACT 1987

TELARC REGISTERED SUPPLIER

Summary of your rights and responsibilities

(Not part of the resource consent)

This resource consent gives you the right to use a public resource (e.g. water, air, the coastal marine area) in the manner specified in the consent.

You may exercise the resource consent how you see fit provided that you comply with all the conditions of your resource consent and all other laws of the land.

If you wish to change the way you operate under this resource consent or if you wish to alter or delete any consent conditions, please contact the Wellington Regional Council (hereafter referred to as Greater Wellington) prior to making the changes. You may need a formal variation to your resource consent conditions.

You may transfer your coastal, discharge, or water permit to any other person. So if you sell your operation please contact Greater Wellington and we will arrange the transfer. The service is free of charge.

If your resource consent application contained inaccurate or misleading information Greater Wellington may ask the Environment Court to cancel or alter the resource consent.

Your resource consent does not:

- provide any warranty of any structure or process;
- provide any guarantee that the resource will be available at all times;
- provide any right of access through or over public or private land;
- negate the need for any approvals necessary under other legislation.

You, as the holder(s) of this resource consent and your agents (including contractors and employees), are jointly and severally liable for compliance with the conditions of this consent. It's important that anyone operating on your behalf fully understands and complies with the conditions of the resource consent.

You are required to pay any relevant charges that are associated with the consent. Greater Wellington fixes these charges under section 36 of the Resource Management Act 1991. The Act allows you to comment on any proposed charges *prior to them being fixed*. Charges are usually fixed every three years. If you would like a copy of our current Resource Management Charging Policy please ask us.

You are required to allow Greater Wellington Enforcement Officers access to your site and operation at any reasonable time so that we can inspect your operation and confirm that it is complying with the resource consent.

Your resource consent will lapse if you do not exercise it within five years of the date it was granted (unless otherwise specified in the resource consent conditions). If this lapsing is going to be a problem for you please contact Greater Wellington before the lapse date.

If you stop using your resource consent for a continuous five-year period, Greater Wellington may cancel your resource consent. We will advise you in advance if we propose to cancel your consent. You also have the right to object to your consent being cancelled.

This consent is issued without prejudice to any claim that is lodged with the Waitangi Tribunal in relation to the customary ownership of natural resources, whether it be a claim that is pending hearing or whether it is a claim that is awaiting settlement by the Crown.

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Conditions to Resource Consent WGN040184 [23260]

General conditions

1. The location, design, implementation and operation of the Stage 2 development of the Silverstream Landfill shall be generally as described in the resource consent application and associated documents dated November 2003, except where amendments are required by conditions of these consents. In the event of differences or conflict between the measures described in the documents and the conditions, the conditions shall prevail.

2. The consent holder shall pass a copy of this consent and associated documents to any operator or contractor operating the Landfill or carrying out works permitted by the consent on their behalf prior to the works commencing.

3. The consent holder shall pay to Wellington Regional Council any administrative charge fixed in accordance with Section 36 of the Resource Management Act 1991, or any charge prescribed in accordance with regulations made under Section 36 of the Resource Management Act 1991.

4. Pursuant to Section 128 of the Resource Management Act 1991 the Wellington Regional Council may commence a review of any of the conditions of any of the consents, at any time within six months of the second, fifth, tenth, fifteenth, twenty-fifth and thirtieth anniversaries of the date of grant of this permit for any of the following purposes:

   - To deal with any actual or potential adverse effect on the environment which may arise from the exercise of the consent and which it is appropriate to deal with at a later stage; and/or
   - To review the adequacy of any plan prepared for this permit and incorporating any requirements into relevant conditions; and/or
   - To require additional monitoring to assess impacts, or specific action to be taken to mitigate demonstrated environmental impacts; and/or
   - To allow a reduction in the level of monitoring.

5. Not less than six months prior to the expiry or surrender of this consent, the consent holder shall apply for such consents as are required for either the closure or future management of the landfill.

Specific conditions

6. The Manager, Consents Management, Wellington Regional Council, shall be given a minimum of 48 hours notice prior to the works commencing.

7. Earthworks shall be constructed and carried out in accordance with the principles contained in the "Erosion and Sediment Control Guidelines for the Wellington Region", dated September 2002.

8. If kōiwi, taonga or other artefact material is discovered in any area during the works, the consent holder shall ensure that Te Runanganui o Taranaki Whanui ki te Upoko o te Ika a Maui and Wellington Tenths Trust are immediately contacted. Construction work in that area shall be stopped immediately to allow a site inspection by these groups and their advisors. The consent holder shall then consult with Te Runanganui o Taranaki Whanui ki te Upoko o te Ika a Maui and Wellington Tenths Trust on appropriate steps to recover the artefacts in order that work can resume.

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9. The consent holder shall take all practicable steps to ensure that the works do not result in vegetation, soil, slash or other debris entering any surface water body.

10. The works shall remain the responsibility of the consent holder and shall be maintained to minimise effect on slope stability, erosion and sedimentation to the satisfaction of the Manager, Consents Management, Wellington Regional Council.

11. All construction works shall be 'stabilised' in the minimum time practicable.

Note: For the purposes of Condition 11, 'stabilised' in relation to any site or area means inherently resistant to erosion or rendered resistant, such as by using indurated rock or by the application of basecourse, colluvium, grassing, mulch, or another method to the reasonable satisfaction of the Manager, Consents Management, Wellington Regional Council and as specified in the Wellington Regional Council's "Erosion and Sediment Control Guidelines for the Wellington Region", dated September 2002. Where seeding or grassing is used on a surface that is not otherwise resistant to erosion, the surface is considered stabilised once, on reasonable visual inspection by the Manager, Consents Management, Wellington Regional Council, an 80% vegetative cover has been established.

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Resource Consent

RESOURCE MANAGEMENT ACT 1991

RELEASED UNDER THE LOCAL GOVERNMENT AND MEETINGS ACT 1987

Consent No. WGN040184 [23261]

Category: Land use consent

Pursuant to sections 104C and 108, and subject to all the relevant provisions of the Resource Management Act 1991 and any regulations made thereunder, a consent in respect of a natural resource is hereby granted to:

Name	Hutt City Council
Address	30 Laings Road, Lower Hutt
Term of consent	Effective: 13 May 2004 — Expires: 13 May 2039
Purpose for which right is granted	To clear vegetation from the landfill footprint, access roads, drains and the borrow area.
Location	Silverstream Landfill is located immediately north of Stokes Valley, and is within the jurisdictional areas of Hutt City Council and the Greater Wellington Regional Council. This proposal is for the Stage 2 development of the existing landfill and is within the valley, immediately downstream of the existing landfill, at or about map reference NZMS 260:R27;775.035.
Legal description of land	Sec 204 and Part Sec 191, 194, 195 and 205 Hutt District, and Lots 1 and 4 DP 27329. Part Sec 742, Hutt District.
Volume/quantity/rate	N/A
Conditions	1-14 as attached

For and on behalf of
WELLINGTON REGIONAL COUNCIL

Manager, Consents Management

Date: .....

TELARC REGISTERED SUPPLIER

Summary of your rights and responsibilities

(Not part of the resource consent)

This resource consent gives you the right to use a public resource (e.g. water, air, the coastal marine area) in the manner specified in the consent.

You may exercise the resource consent how you see fit provided that you comply with all the conditions of your resource consent and all other laws of the land.

If you wish to change the way you operate under this resource consent or if you wish to alter or delete any consent conditions, please contact the Wellington Regional Council (hereafter referred to as Greater Wellington) prior to making the changes. You may need a formal variation to your resource consent conditions.

You may transfer your coastal, discharge, or water permit to any other person. So if you sell your operation please contact Greater Wellington and we will arrange the transfer. The service is free of charge.

If your resource consent application contained inaccurate or misleading information Greater Wellington may ask the Environment Court to cancel or alter the resource consent.

Your resource consent does not:

- provide any warranty of any structure or process;
- provide any guarantee that the resource will be available at all times;
- provide any right of access through or over public or private land;
- negate the need for any approvals necessary under other legislation.

You, as the holder(s) of this resource consent and your agents (including contractors and employees), are jointly and severally liable for compliance with the conditions of this consent. It's important that anyone operating on your behalf fully understands and complies with the conditions of the resource consent.

You are required to pay any relevant charges that are associated with the consent. Greater Wellington fixes these charges under section 36 of the Resource Management Act 1991. The Act allows you to comment on any proposed charges *prior to them being fixed*. Charges are usually fixed every three years. If you would like a copy of our current Resource Management Charging Policy please ask us.

You are required to allow Greater Wellington Enforcement Officers access to your site and operation at any reasonable time so that we can inspect your operation and confirm that it is complying with the resource consent.

Your resource consent will lapse if you do not exercise it within five years of the date it was granted (unless otherwise specified in the resource consent conditions). If this lapsing is going to be a problem for you please contact Greater Wellington before the lapse date.

If you stop using your resource consent for a continuous five-year period, Greater Wellington may cancel your resource consent. We will advise you in advance if we propose to cancel your consent. You also have the right to object to your consent being cancelled.

This consent is issued without prejudice to any claim that is lodged with the Waitangi Tribunal in relation to the customary ownership of natural resources, whether it be a claim that is pending hearing or whether it is a claim that is awaiting settlement by the Crown.

RELEASED UNDER THE LOCAL GOVERNMENT AND MEETINGS ACT 1987

Conditions to Resource Consent WGN040184 [23261]

General conditions

1. The location, design, implementation and operation of the Stage 2 development of the Silverstream Landfill shall be generally as described in the resource consent application and associated documents dated November 2003, except where amendments are required by conditions of these consents. In the event of differences or conflict between the measures described in the documents and the conditions, the conditions shall prevail.

2. The consent holder shall pass a copy of this consent and associated documents to any operator or contractor operating the Landfill or carrying out works permitted by the consent on their behalf prior to the works commencing.

3. The consent holder shall pay to Wellington Regional Council any administrative charge fixed in accordance with Section 36 of the Resource Management Act 1991, or any charge prescribed in accordance with regulations made under Section 36 of the Resource Management Act 1991.

4. Pursuant to Section 128 of the Resource Management Act 1991 the Wellington Regional Council may commence a review of any of the conditions of any of the consents, at any time within six months of the second, fifth, tenth, fifteenth, twenty-fifth and thirtieth anniversaries of the date of grant of this consent for any of the following purposes:

   - To deal with any actual or potential adverse effect on the environment which may arise from the exercise of the consent and which it is appropriate to deal with at a later stage; and/or
   - To require additional monitoring to assess impacts, or specific action to be taken to mitigate demonstrated environmental impacts; and/or
   - To allow a reduction in the level of monitoring.

5. Not less than six months prior to the expiry or surrender of this consent, the consent holder shall apply for such consents as are required for either the closure or future management of the landfill.

Specific conditions

6. The Manager, Consents Management, Wellington Regional Council, shall be given a minimum of 48 hours notice prior to the works commencing.

Erosion and sediment control

7. All practicable steps shall be taken to minimise sediment loading and increased turbidity of the Tip Stream during vegetation clearance, including but not limited to, the installation of silt fences around the excavation areas.

8. The silt fences shall remain in place until the areas of excavated material are 'stabilised'. The permit holder shall ensure the areas of excavated material are 'stabilised' as soon as practicable after completion of the earthworks, and within four months of that completion.

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Note: For the purposes of condition 8, 'stabilised' in relation to any site or area means inherently resistant to erosion or rendered resistant, such as by using indurated rock or by the application of basecourse, colluvium, grassing, mulch, or another method to the reasonable satisfaction of the Manager, Consents Management, Wellington Regional Council and as specified in the Wellington Regional Council's "Erosion and Sediment Control Guidelines for the Wellington Region", dated September 2002. Where seeding or grassing is used on a surface that is not otherwise resistant to erosion, the surface is considered stabilised once, on reasonable visual inspection by the Manager, Consents Management, Wellington Regional Council, an 80% vegetative cover has been established.

9. All sediment control measures shall be operated and maintained efficiently in accordance with the Wellington Regional Council's "Erosion and Sediment Control Guidelines for the Wellington Region", dated September 2002, and to the reasonable satisfaction of the Manager, Consents Management, Wellington Regional Council.

Water quality

10. No contaminants (including but not limited to oil, petrol, diesel, hydraulic fluid) shall be released into water from equipment being used for the activity, and no machinery shall be cleaned, stored or refuelled within ten metres of any waterbody.

11. The works shall remain the responsibility of the consent holder and shall be maintained to minimise effect on slope stability so that any erosion of the bed or banks of any watercourse as a result of the works is minimised.

12. The consent holder shall take all practicable steps to ensure that the works do not result in vegetation, soil, slash or other debris entering any surface water body.

Artefacts

13. If koiwi, taonga or other artefact material is discovered in any area during the works, the consent holder shall ensure that Te Runanganui o Taranaki Whanui ki te Upoko o te Ika a Maui and Wellington Tenths Trust are immediately contacted, and construction work in that area shall be stopped immediately to allow a site inspection by these groups and their advisors. The consent holder shall then consult with Te Runanganui o Taranaki Whanui ki te Upoko o te Ika a Maui and Wellington Tenths Trust on appropriate steps to recover the artefacts in order that work can resume.

Completion of works

14. All works, including tidy up on completion of the works, shall be to the satisfaction of the Manager, Consents Management, Wellington Regional Council.

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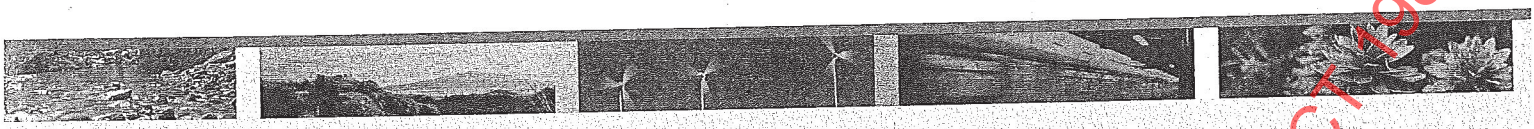

Resource Consent

RESOURCE MANAGEMENT ACT 1991

Consent No. WGN040184 [23262]

Category: Land use consent

Pursuant to sections 104B and 108, and subject to all the relevant provisions of the Resource Management Act 1991 and any regulations made thereunder, a consent in respect of a natural resource is hereby granted to:

Name	Hutt City Council
Address	30 Laings Road, Lower Hutt
Term of consent	Effective: 13 May 2004 — Expires: 13 May 2039
Purpose for which right is granted	To construct bores for monitoring groundwater quality.
Location	Silverstream Landfill is located immediately north of Stokes Valley, and is within the jurisdictional areas of Hutt City Council and the Greater Wellington Regional Council. This proposal is for the Stage 2 development of the existing landfill and is within the valley, immediately downstream of the existing landfill, at or about map reference NZMS 260:R27;775.035.
Legal description of land	Sec 204 and Part Sec 191, 194, 195 and 205 Hutt District, and Lots 1 and 4 DP 27329. Part Sec 742, Hutt District.
Volume/quantity/rate	N/A
Conditions	1-5 as attached

For and on behalf of
WELLINGTON REGIONAL COUNCIL

Manager, Consents Management

Date: .....

RELEASED UNDER THE LOCAL GOVERNMENT AND MEETINGS ACT 1987

TELARC REGISTERED SUPPLIER

Summary of your rights and responsibilities

(Not part of the resource consent)

This resource consent gives you the right to use a public resource (e.g. water, air, the coastal marine area) in the manner specified in the consent.

You may exercise the resource consent how you see fit provided that you comply with all the conditions of your resource consent and all other laws of the land.

If you wish to change the way you operate under this resource consent or if you wish to alter or delete any consent conditions, please contact the Wellington Regional Council (hereafter referred to as Greater Wellington) prior to making the changes. You may need a formal variation to your resource consent conditions.

You may transfer your coastal, discharge, or water permit to any other person. So if you sell your operation please contact Greater Wellington and we will arrange the transfer. The service is free of charge.

If your resource consent application contained inaccurate or misleading information Greater Wellington may ask the Environment Court to cancel or alter the resource consent.

Your resource consent does not:

- provide any warranty of any structure or process;
- provide any guarantee that the resource will be available at all times;
- provide any right of access through or over public or private land;
- negate the need for any approvals necessary under other legislation.

You, as the holder(s) of this resource consent and your agents (including contractors and employees), are jointly and severally liable for compliance with the conditions of this consent. It's important that anyone operating on your behalf fully understands and complies with the conditions of the resource consent.

You are required to pay any relevant charges that are associated with the consent. Greater Wellington fixes these charges under section 36 of the Resource Management Act 1991. The Act allows you to comment on any proposed charges *prior to them being fixed*. Charges are usually fixed every three years. If you would like a copy of our current Resource Management Charging Policy please ask us.

You are required to allow Greater Wellington Enforcement Officers access to your site and operation at any reasonable time so that we can inspect your operation and confirm that it is complying with the resource consent.

Your resource consent will lapse if you do not exercise it within five years of the date it was granted (unless otherwise specified in the resource consent conditions). If this lapsing is going to be a problem for you please contact Greater Wellington before the lapse date.

If you stop using your resource consent for a continuous five-year period, Greater Wellington may cancel your resource consent. We will advise you in advance if we propose to cancel your consent. You also have the right to object to your consent being cancelled.

This consent is issued without prejudice to any claim that is lodged with the Waitangi Tribunal in relation to the customary ownership of natural resources, whether it be a claim that is pending hearing or whether it is a claim that is awaiting settlement by the Crown.

RELEASED UNDER THE LOCAL GOVERNMENT AND MEETINGS ACT 1987

Conditions to Resource Consent WGN040184 [23262]

General conditions

1. The location, design, implementation and operation of the bores shall be generally as described in the resource consent application for Stage 2 development of the Silverstream Landfill and associated documents dated November 2003, except where amendments are required by conditions of these consents. In the event of differences or conflict between the measures described in the documents and the conditions, the conditions shall prevail.

Specific conditions

2. Prior to the bores being constructed, the consent holder shall provide a copy of this consent to the driller who will construct the bores.

3. The bores shall be constructed and maintained in accordance with the New Zealand Environmental Standard for Drilling of Soil and Rock (NZS 4411:2001).

4. Within one month of the completion of the bores, the consent holder shall submit to the Manager, Consents Management, Wellington Regional Council, a copy of the Bore Log form as completed by the driller who constructed the bores.

5. All monitoring bores shall be constructed and secured so as to prevent ingress of surface waters or other contaminants.

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Resource Consent

RESOURCE MANAGEMENT ACT 1991

RELEASED UNDER THE LOCAL GOVERNMENT AND MEETINGS ACT 1987

Consent No. WGN040184 [23263]

Category: Land use consent

Pursuant to sections 104B and 108, and subject to all the relevant provisions of the Resource Management Act 1991 and any regulations made thereunder, a consent in respect of a natural resource is hereby granted to:

Name	Hutt City Council
Address	30 Laings Road, Lower Hutt
Term of consent	Effective: 13 May 2004 — Expires: Unlimited
Purpose for which right is granted	To reclaim a section of Tip Stream for landfilling purposes.
Location	Silverstream Landfill is located immediately north of Stokes Valley, and is within the jurisdictional areas of Hutt City Council and the Greater Wellington Regional Council. This proposal is for the Stage 2 development of the existing landfill and is within the valley, immediately downstream of the existing landfill, at or about map reference NZMS 260:R27;775.035.
Legal description of land	Sec 204 and Part Sec 191, 194, 195 and 205 Hutt District, and Lots 1 and 4 DP 27329. Part Sec 742, Hutt District.
Volume/quantity/rate	N/A
Conditions	1-8 as attached

For and on behalf of
WELLINGTON REGIONAL COUNCIL

Manager, Consents Management

Date: .....

TELARC REGISTERED SUPPLIER

Summary of your rights and responsibilities

(Not part of the resource consent)

This resource consent gives you the right to use a public resource (e.g. water, air, the coastal marine area) in the manner specified in the consent.

You may exercise the resource consent how you see fit provided that you comply with all the conditions of your resource consent and all other laws of the land.

If you wish to change the way you operate under this resource consent or if you wish to alter or delete any consent conditions, please contact the Wellington Regional Council (hereafter referred to as Greater Wellington) prior to making the changes. You may need a formal variation to your resource consent conditions.

You may transfer your coastal, discharge, or water permit to any other person. So if you sell your operation please contact Greater Wellington and we will arrange the transfer. The service is free of charge.

If your resource consent application contained inaccurate or misleading information Greater Wellington may ask the Environment Court to cancel or alter the resource consent.

Your resource consent does not:

- provide any warranty of any structure or process;
- provide any guarantee that the resource will be available at all times;
- provide any right of access through or over public or private land;
- negate the need for any approvals necessary under other legislation.

You, as the holder(s) of this resource consent and your agents (including contractors and employees), are jointly and severally liable for compliance with the conditions of this consent. It's important that anyone operating on your behalf fully understands and complies with the conditions of the resource consent.

You are required to pay any relevant charges that are associated with the consent. Greater Wellington fixes these charges under section 36 of the Resource Management Act 1991. The Act allows you to comment on any proposed charges *prior to them being fixed*. Charges are usually fixed every three years. If you would like a copy of our current Resource Management Charging Policy please ask us.

You are required to allow Greater Wellington Enforcement Officers access to your site and operation at any reasonable time so that we can inspect your operation and confirm that it is complying with the resource consent.

Your resource consent will lapse if you do not exercise it within five years of the date it was granted (unless otherwise specified in the resource consent conditions). If this lapsing is going to be a problem for you please contact Greater Wellington before the lapse date.

If you stop using your resource consent for a continuous five-year period, Greater Wellington may cancel your resource consent. We will advise you in advance if we propose to cancel your consent. You also have the right to object to your consent being cancelled.

This consent is issued without prejudice to any claim that is lodged with the Waitangi Tribunal in relation to the customary ownership of natural resources, whether it be a claim that is pending hearing or whether it is a claim that is awaiting settlement by the Crown.

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Conditions to Resource Consent WGN040184 [23263]

General conditions

1. The location, design, implementation and operation of the reclamation shall be generally as described in the resource consent application for the Stage 2 development of the Silverstream Landfill and associated documents dated November 2003, except where amendments are required by conditions of these consents. In the event of differences or conflict between the measures described in the documents and the conditions, the conditions shall prevail.

2. The consent holder shall pass a copy of this consent and associated documents to any operator or contractor carrying out works permitted by this consent prior to the works commencing.

3. The consent holder shall pay to Wellington Regional Council any administrative charge fixed in accordance with Section 36 of the Resource Management Act 1991, or any charge prescribed in accordance with regulations made under Section 36 of the Resource Management Act 1991.

Specific conditions

4. The Manager, Consents Management, Wellington Regional Council, shall be given a minimum of 48 hours notice prior to the works commencing.

Construction conditions

5. All practicable steps shall be taken to prevent silt run-off from the fill in the streambed. Such steps shall be to the satisfaction of the Manager, Consents Management, Wellington Regional Council.

6. All works affecting the bed of the stream, including tidy up on completion of the works shall be completed to the satisfaction of the Manager, Consents Management, Wellington Regional Council.

7. The consent holder shall ensure that any fish that are stranded during construction and dewatering are immediately placed back in the active flowing channel. Dewatering is the process of the former area of active flowing channel losing water after the new channel begins to operate.

8. No fill shall be placed in the streambed until the stream has been dewatered.

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Standard Conditions

1. This consent is subject to all relevant provisions of the Resource Management Act 1991, its amendments and any regulations made thereunder. It is the obligation of the consent holder to comply with all the statutory requirements relating to the exercise thereof.

2. The consent holder may keep all such records as may be reasonably required by the Wellington Regional Council and shall, if so requested, supply this information to the Wellington Regional Council.

3. This consent is subject to the Wellington Regional Council or its servants, or its agents, being permitted access at all reasonable times for the purpose of carrying out inspections, measurements and the taking of samples.

4. The design and maintenance of any works relating to the exercise of the consent must be to a standard adequate to meet the conditions of the consent.

5. An annual charge, set in accordance with section 36(2) of the Resource Management Act 1991, shall be paid to the Wellington Regional Council for carrying out its functions in relation to the administration, monitoring and supervision of resource consents, and for carrying out its functions under section 35 (duty to gather information, monitor and keep records) of the Act.

General Information

[not part of the consent]

1. The granting of this consent does not imply compliance with the requirements of any other statute, bylaw or regulation.

2. A consent may be exercised only for the purpose stated in that consent. For example, a consent to take water does not authorise the discharge of water or contaminant into water.

3. A water or discharge consent is not an authority to obtain access to a source of water or a point of discharge.

4. In granting a consent to take or use water the Wellington Regional Council does not guarantee or represent that the quality or quantity specified or implied will be available or maintained.

5. The consent holder must, when required, supply the Wellington Regional Council with information on the exercise of the consent.

6. If there is a serious temporary shortage of water the Wellington Regional Council may issue a direction under section 329 that the taking or use of any water be apportioned, restricted or suspended for a period of up to 14 days and such a direction may be renewed from time to time.

7. The consent holder may apply, pursuant to section 127, to the Wellington Regional Council for a change or cancellation of consent conditions, except that the term of the consent cannot be extended by such a change.

8. A consent shall be exercised only by the consent holder or their duly authorised agent. A coastal, water or discharge consent may, pursuant to sections 135, 136 and 137 and upon written notice to the Wellington Regional Council, be transferred to a new owner of the land in respect of which the consent is granted but on the same terms and conditions and for the same purpose as set out in the consent.

9. The consent holder shall make payment of such annual resource management cost recovery fees as may be notified and confirmed by the Wellington Regional Council from time to time in accordance with section 36 of the Resource Management Act 1991.

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Additional Conditions to Resource Consent WGN970164

(6) The location, design, implementation and operation of the Silverstream Landfill shall be as generally described in the resource consent application and associated documents dated April 1997, as well as the additional information lodged with the Wellington Regional Council.

Note: Any change from the location, design concepts and parameters, implementation and/or operation may require a change in permit conditions pursuant to section 127 of the Resource Management Act 1991.

(7) This consent shall expire on 2 July 2007 (for WGN 970164(01)) and 2 July 2032 (for permits WGN 970164(02)-WGN 970164(08)).

(8) The Wellington Regional Council may review any or all conditions of this permit by giving notice of its intention to do so pursuant to section 128 of the Resource Management Act 1991, at any of the following specified times:

(a) within six months of the second, fifth, and seventh (10th, 15th, 20th, 25th, 30th for all but Discharge to Land 970164(01)) anniversary of the date of commencement of this permit;

(b) within six months of the submission of any revised operational plan, waste acceptance guidelines, contingency plan, or closure plan; and

(c) within three months of the submission of the quarterly monitoring report which shows potential environmental contamination arising as a result of the operation of the landfill, or which shows consistently good results indicating that a reduced level of monitoring may be appropriate.

(9) The permit holder may apply, pursuant to section 127 of the Resource Management Act 1991, for the change or cancellation of any condition, other than the condition relating to the term of this permit at any of the times set out in condition 8 .

(10) The review of conditions, as referred to in condition 8 and 9, shall be for the purposes of:

(a) dealing with any adverse effects on the environment which may arise from the exercise of this permit, and which it is appropriate to deal with at a later stage;

(b) reviewing the adequacy of any plan prepared for this permit and incorporating any requirements into relevant conditions;

(c) requiring additional monitoring to assess impacts, or specific action to be taken to mitigate demonstrated environmental impacts; and

(d) allowing a reduction in the level of monitoring.

(11) All monitoring methods and procedures shall be to the specific approval of the Manager, Consents Management, Wellington Regional Council.

(12) Within three months of the commencement of this permit, the permit holder shall prepare an Operational Management Plan, in consultation with the Public Health Service and the Asset and Quality Manager of Metro Water, to the satisfaction of the Manager, Consents Management, Wellington Regional Council. The Operational Management Plan may be altered from time to time. Such alterations shall be to the satisfaction of the Manager, Consents Management, Wellington Regional Council. The Operational Management Plan shall include, but not be limited to:

(a) Description of the maintenance and development of the landfill;

(b) Description of the monitoring programme and record keeping relating to the consents;

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(c) Description of hazardous waste acceptance criteria as specified in the "Guide to the Disposal of Wastes at Hutt City Council Landfills" and methods of handling any unacceptable materials and the disposal of such material to an alternative facility;

(d) The emergency procedures to be followed in the event of natural emergencies and hazardous waste spills;

(e) The methods of controlling dust and odour emissions including the criteria for assessing when, and how regularly, roadways and the current landfill stages are dampened by water cart, or otherwise; and methods for reducing fugitive dust and odour emissions during deposition of materials to the landfill face; and

(f) Description of how landfill nuisances will be dealt with, including what measures are to be taken to address the large gull population in consultation with the Wellington International Airport Limited.

This permit shall be exercised in accordance with the aforesaid Operational Management Plan prepared by the permit holder.

(13) Prior to the expiry or surrender of this permit, the permit holder shall prepare and implement a plan, to the satisfaction of the Manager, Consents Management, Wellington Regional Council, for either the closure or future management of the landfill. The permit holder shall, not less than six months prior to such expiry or surrender, make application for such consents as are required for the future management of the landfill site. The objectives to be met at all stages of this management are:

(a) to ensure the effective long-term containment of landfill;

(b) to protect Tip Stream and uses and values associated with these waters;

(c) to protect the groundwater downstream of the landfill; and

(d) to ensure the surficial layer of the landfill is compacted and constructed in a manner that is appropriate to the intended future use of the landfill.

(14) The permit holder's interest in this consent may not be transferred to any owner or occupier of the site pursuant to section 137 of the Resource Management Act 1991.

(15)[1] The permit holder shall monitor water quality in Tip Stream at sampling locations to be approved by the Manager, Environmental Regulation, Wellington Regional Council. The permit holder shall provide the sampling protocols to the Manager, Environmental Regulation, Wellington Regional Council, at least one month before sampling commences. To this end, the permit holder shall monitor for the following parameters twice a year, to coincide with low flow during the winter groundwater level maximum (September) and summer groundwater minimum (April):

- estimate of flow
- pH (field and laboratory)
- conductivity (field and laboratory)
- BOD5
- Chloride
- Potassium
- ammoniacal nitrogen
- nitrate nitrogen
- dissolved reactive phosphorous
- potassium
- total zinc
- total boron
- suspended solids.

Sampling shall be undertaken in accordance with protocols approved in writing by the Manager, Environmental

[1] Condition changed under section 127 of the Resource Management Act 1991 granted 12/04/11

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Additional Conditions to Resource Consent WGN970164 (cont'd)

Regulation, Wellington Regional Council. The results of such monitoring shall be reported in writing to the Manager, Environmental Regulation, Wellington Regional Council within two months of completion of the sampling.

~~(16)[2] The use of the ANZECC irrigation guidelines may be reviewed two years from the date of commencement of this permit.~~

(17)[3] If monitoring of the discharge system indicates leachate contamination, then the permit holder shall take immediate steps to prevent further leachate contamination and immediately report to the Manager, Environmental Regulation, Wellington Regional Council on actions taken and further actions proposed to address leachate contamination.

(18) The discharge rate shall be recorded at SW3 on a monthly basis.

(19) Rainfall at the landfill site shall be measured on a daily basis.

(20)[4] The permit holder shall produce and submit a summary report, for the preceding three months to the Manager, Environmental Regulation, Wellington Regional Council by 30 April, 31 July, 31 October and 31 January of each year, or on request. The summary report shall include:

- The results of all monitoring undertaken and an interpretation of the results as to the impact on Tip Stream.
- The results of any waste surveys.
- Copies of any records required by conditions.

(21)[5] ~~The permit holder shall produce and submit a summary report for the proceeding three months to the Asset and Quality Manager of Metro Water by 30 April, 31 July, 31 October and 31 January of each year including the results of all monitoring undertaken and an interpretation of the results.~~

(22) The discharge of stormwater shall not result in any of the following effects in Tip Stream observed at the boundary of the landfill property:

(a) The production of any conspicuous oil or grease films, scums or foams or floatable or suspended material.

(b) Any conspicuous change in colour or visual clarity.

(c) Any emission of objectionable odour.

(d) The rendering of fresh water unsuitable for consumption by farm animals.

(e) Any significant adverse effect on aquatic life.

(f) Any visible deposition of iron oxide.

(23) The permit holder shall carry out regular inspections of Tip Stream below Silverstream Landfill monthly and following time of moderate heavy rain for compliance with condition 22. The results of these inspections shall be included in the quarterly report required by condition 20.

(24) Stormwater which has come in contact with the active tipping face shall not be disposed of to Tip Stream.

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[2] Condition deleted under section 127 of the Resource Management Act 1991 granted 12/04/11
[3] Condition changed under section 127 of the Resource Management Act 1991 granted 12/04/11
[4] Condition changed under section 127 of the Resource Management Act 1991 granted 24/04/17
[5] Condition deleted under section 127 of the Resource Management Act 1991 granted 24/04/17

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(25) The permit holder shall place and maintain an appropriate sign near Tip Stream on the boundary of the landfill and the Silverstream Park Christian Centre to the satisfaction of Manager, Consents Management, Wellington Regional Council. This sign shall:

Additional Conditions to Resource Consent WGN970164 (cont'd)

(a) Provide clear identification of the location and nature of the discharge and advise that the stream is not suitable for contact recreation; and

(b) Be visible to the public visiting the area without unnecessarily detracting from the visual amenity of the area.

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Appendix B: Site layout map showing monitoring locations

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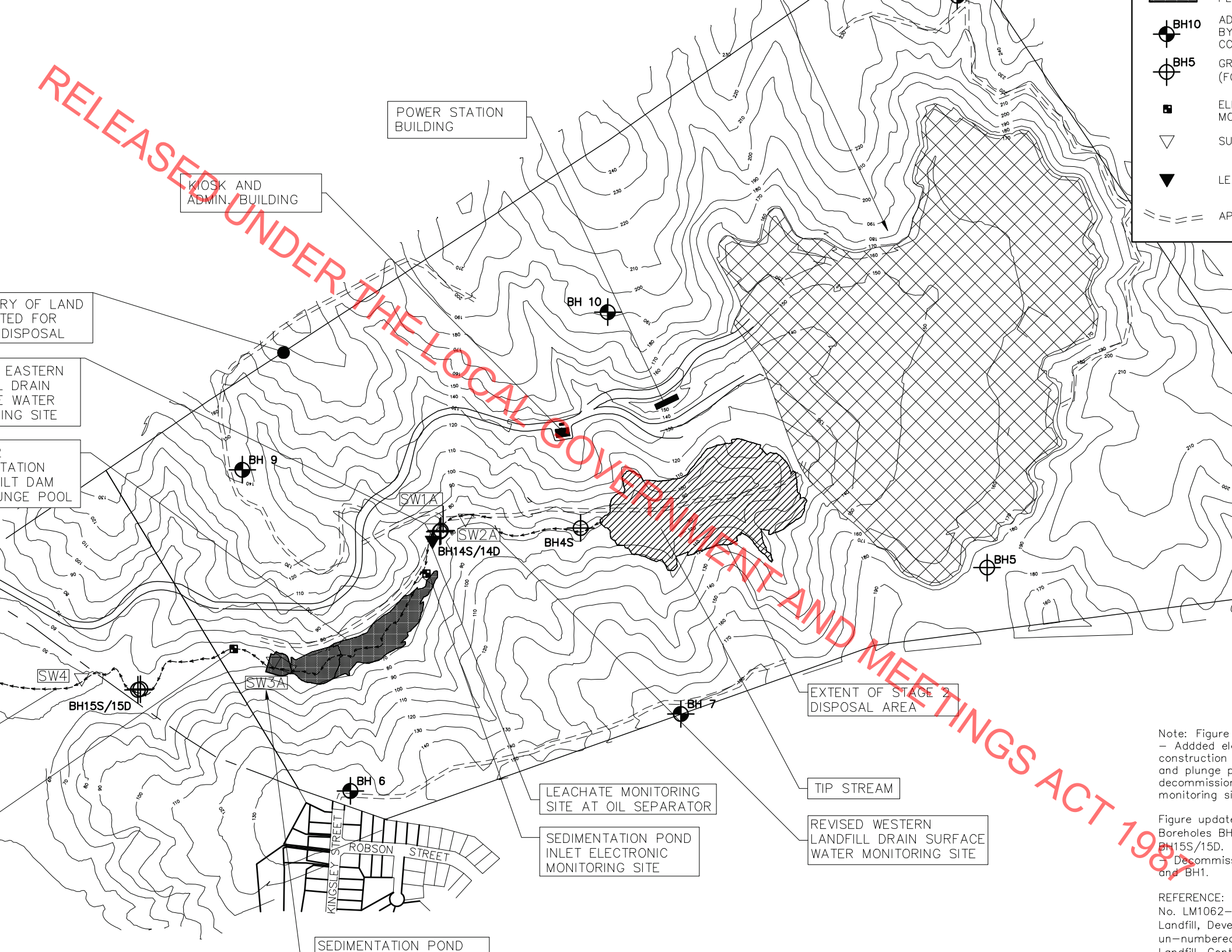

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Appendix C: Hutt City Council Landfills: Waste Disposal Guide

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Hutt City Council

Waste Disposal Guide
Hutt City Landfills

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Appendix D: Waste acceptance guidelines, Silverstream Landfill

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1 Purpose of the guide

The purpose of this guide is to assist waste generators in the proper disposal of waste to HCC landfills. It provides guidance to waste generators on waste classifications (Section 2) and procedures for waste acceptance (Section 3). This document supersedes the May 1999 guide.

Generators of waste will either be disposing of the waste directly, or retaining a waste disposal company. All parties involved in waste disposal (generators, waste disposal contractors, and transporters) must be aware of the nature of the waste being disposed and be accountable for it.

1.1 Waste reduction

All wastes should be reduced, reused, or recycled if possible prior to disposal. A list of recycling companies known to HCC is attached as Appendix A. The list is not exhaustive. Further information on cleaner production is available from HCC on request.

1.2 HCC's Industrial Waste Policy

HCC will operate industrial waste facilities that enable sustainable and cost effective means of disposal for a wide range of industrial wastes.

HCC will encourage waste generators to implement the following waste management hierarchy to the greatest extent practical:

- reduce the amount and toxicity of material entering the waste stream;
- reuse materials;
- recycle the materials that cannot be reused; and
- recover resources from the waste stream.

HCC will continue to promote the introduction of cleaner production practices.

Charges for the disposal of industrial wastes will be set to recover the full cost of disposal including the long-term management risks.

Policies will be consistent with the Resource Management Act and in particular the sustainable management of natural and physical resources.

1.3 Authorisation

This guide has been authorised for Hutt City Council by:

.....

Bruce Sherlock

General Manager Infrastructure

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2 Waste classification

Waste is categorised as **General Waste, Listed Special Waste, Special/Hazardous Waste, or Prohibited Waste.** Definitions and examples of each type are provided below.

2.1 General Waste

General Waste is material that poses no extra risk to landfill staff or the environment. It typically comprises solid waste generated by domestic premises (e.g., households, hotels and other housing establishments) and commercial waste that is not classified as Special Waste. General Waste includes:

- Home-use chemicals, such as:
  - Solvent-based adhesives and sealants, non-aqueous based paints, paint thinners, household cleaners, up to 2 litres or 2 kg per load
  - Water based paint, up to 10 litres per load
  - Associated waste items such as rags, used brushes and empty containers
- Dry cell, "button", rechargeable and lithium batteries; in reasonable household quantities.
- Smoke alarms
- Pharmaceutical wastes - up to 1 litre or 1 kg per load
- Medical waste, complying with the general waste category of NZS 4304:1990
- Business office wastes
- Construction and demolition debris
- Wire rope and steel formed sections that are cut into lengths of 1 metre maximum
- Empty containers, excluding containers of hazardous substances. Containers larger than 20 litres must be crushed prior to disposal

The following wastes are **not** acceptable as General Waste:

- **Lead-acid batteries.** A recycling facility is available within the landfill
- **Pool chemicals.** Empty and washed out containers are acceptable
- **Pesticides.** Greater than 1 kg. Empty household size pesticide containers are acceptable.
- **Lubricating and other oils.** A recycling facility is available at the landfill

2.2 Listed Special Wastes

Listed Special Wastes are generally non-hazardous but require immediate burial, and include:

- Asbestos waste, including building demolition, maintenance or cleaning, wallboard, roofing, wall and ceiling spray coverings and pipe insulation. The asbestos must be thoroughly wetted (or modified by a bonding agent or coating) and packaged in accordance with the Health and Safety in Employment (Asbestos) Regulations 1998.
- Commercial products or chemicals and their containers that are off-specification, outdated or unusable, provided they are visually identifiable and non-hazardous.
- Empty containers that once held hazardous substances. Containers must be empty according to label directions, triple rinsed with an appropriate solvent or cleaned by an equivalent method and rendered unusable. All drums must be crushed prior to disposal.
- Commercial wastes from non-manufacturing, retail and wholesale businesses, warehousing, service and transportation activities.

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- Industrial and manufacturing non-hazardous wastes.
- Wire rope and steel formed sections longer than 1 metre.
- Bulky industrial and commercial items such as large construction materials or components.
- Commercially sensitive non-hazardous materials that require witnessed burials (e.g. police files and confidential records).
- Aesthetically disturbing materials such as dead animals.
- Dust, including cereal dusts, carpet and wool dusts and carbon black/soot.
- Odorous non-hazardous waste.
- Sludges with no free liquid present, greater than 20% solid content, a slump of less than 200mm, arising from:
  - Septic tanks, food service grease traps, Laundromats and car washes.
  - Water treatment plants
  - Sewage treatment plants (Silverstream Landfill only).
- Silverstream Landfill only: sewage treatment plant milliscreenings.

2.3 Special/Hazardous Wastes

Special/Hazardous Wastes are those requiring special handling, burial, and pre-treatment or testing before they can be accepted for landfill disposal. Special/Hazardous Waste is waste that cannot be visually identified or verified as non-hazardous, including:

- Offal. Chicken, fish, paunching and abattoir wastes, fleshings, and fellmongery wastes that have been rejected by the usual processor.
- Infectious wastes that comply with NZS 4304:2002, including hospital, medical clinic, nursing home, medical practitioner, mortuary, veterinary hospital or animal testing laboratory. Infectious wastes have the following restrictions:
  - Infectious waste must be autoclaved or otherwise sterilised so that it is no longer capable of inducing infection. Laboratory pathogenic organism cultures that have not been sterilised are prohibited.
  - Human body parts, except minor tissue samples are prohibited.
  - All “sharps”, (needles and cutting implements) must be rendered harmless or placed in puncture proof containers.
- Waste produced from the demolition or dismantling of industrial process equipment or facilities contaminated with chemicals from an industrial process.
- Agricultural and biological wastes - provided they have no free liquid, and are solidified to more than 20% solids, less than 200mm slump.
- Waste types listed in Table YA, wastes having constituents listed in Table YB, or waste exhibiting the hazardous characteristics described in Table H (see Appendix C).

2.4 Prohibited Wastes

Prohibited wastes cannot be accepted for disposal because they pose an unacceptable risk to landfill staff or the environment.

Wastes exhibiting any of the following characteristics will not be accepted:

- Explosives
- Flammable liquids

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- Flammable solids
- Substances or wastes liable to spontaneous combustion
- Substances or wastes which, in contact with water, emit flammable gases
- Oxidising substances
- Organic peroxides
- Infectious substances
- Radioactive material
- Corrosives
- Substances that liberate toxic gases in contact with air or water
- Capable, by any means, after disposal, of yielding another material, e.g., leachate, which possesses any of the characteristics listed above.

The following specific waste types and waste components are prohibited:

- Waste substances or articles containing or contaminated with polychlorinated biphenyls (PCBs) and/or polychlorinated terphenyls (PCTs) and/or polybrominated biphenyls (PBBs).
- Waste chemical substances, arising from research and development or teaching activities, which are not identified and/or are new and whose effects on human health or the environment are not known.
- Explosive wastes.
- Halogenated organic solvents.
- Polychlorinated dibenzofuran or polychlorinated dibenzo-p-dioxin (any congener or mixture of congeners)

The following categories of wastes, which may or may not be hazardous, are also prohibited, as they do not conform to the requirements of the landfill operating practices.

- Bulk liquids (more than 20 litres).
- Sludges with free liquid present, less than 20% solids, and a slump of greater than 200 mm.
- Sealed drums/containers.
- Electrical fittings that contain PCBs. Electrical fittings that are likely to contain PCB must be disposed of through authorised contractors, not to landfill. Fittings likely to contain PCB are:
  - Resonant start.
  - Dated from 1950 to 1970.
  - Have a capacitor that is round, oval or rectangular, within an aluminium container with a weld running around the top edge and two terminals with quick release tags.
  - Have a capacitor within a rectangular tin container with soldered seams or slightly heavier capacitor than post 1970s types.

  All electrical waste of a type that could contain PCB needs to have a “PCB Free Certificate” before it can be disposed of at HCC landfills.

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3 Waste acceptance

3.1 Acceptance locations

Wainuiomata Landfill accepts General Waste and Listed Special Waste only.

Silverstream Landfill accepts General Waste, Listed Special Waste, and Special/Hazardous waste.

Prohibited wastes will not be accepted at either of the HCC landfills.

3.2 Acceptance procedure

3.2.1 General Waste

No documentation or prior notification is required.

3.2.2 Listed Special Waste

Listed Special Wastes will be accepted upon completion of a "Listed Special Waste Disposal Declaration" form (Appendix B).

The Landfill Operator must be notified at least **24 hours** before disposing of Listed Special Wastes.

Notice shall include a description of the waste and details of the transporter delivering the waste. A fax of the completed declaration form would be appropriate.

A copy of the declaration must be passed to the kiosk attendant at the landfill, at the time of disposal of the load.

3.2.3 Special/Hazardous Waste

The waste generator must complete an "Application for Disposal of Special/Hazardous Waste" (Appendix C). The Generator shall give at least **3 working days** notice to HCC for approval to dispose of Special/Hazardous waste.

HCC will decide whether to accept the waste, based on the composition, physical or chemical properties and regulatory status. HCC may require additional information, such as laboratory analysis results, before making a decision.

If HCC accepts the waste for disposal, a "Waste Acceptance Form" will be issued. A copy of this form must accompany each load of waste delivered to the landfill.

The generator or transporter shall give not less than 1 working days notice to the Landfill Operator prior to the delivery of Special/Hazardous waste to the landfill.

Visual checking, random sampling and analysis of wastes on delivery may be carried out to confirm the waste conforms to the description given on the "Application for Disposal of Special/Hazardous Waste" form.

Any person or organisation who makes false declarations relating to the type of waste being disposed may be refused future entry to the landfill.

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Appendix A: Recycling companies

Material	Company name, location	Contact number
Building materials	Action Building Recyclers, Lower Hutt	s7(2)(a)
	Home Improvers Building Recyclers, Lower Hutt	
	Ironman Building Recyclers, Upper Hutt	
	James Henry Joinery, Upper Hutt	
	No Name Building Recycling, Ngauranga	
	Renovators, Petone	
	Seaview Transfer Station, Seaview	
Car batteries	Ingot Scrap Metals, Seaview	
	Seaview Transfer Station, Seaview	
	Sims Pacific Metals, Seaview	
Paper, cardboard	DOSS Ltd, Seaview	
	Full Circle Recycling	
	Paper Chain, Seaview	
	Seaview Transfer Station, Seaview	
	Transpacific Allbrite Ltd	
Plastics	Pacific Plastics, Otaki	
	Seaview Transfer Station, Seaview	
	Transpacific Allbrite Ltd	
Scrap metals	AKB Ingot Metals, Seaview	
	Capital Recycling Centre, Seaview	
	General Metal Recyclers, Lower Hutt	
	Ingot Scrap Metals, Seaview	
	Macaulay Metals, Petone	
	Parts Export 2008 Ltd, Petone	
	Seaview Transfer Station, Seaview	
	Sims Pacific Metals, Seaview	
	Transpacific Allbrite Ltd	
	Upper Hutt Metals Ltd, Upper Hutt	
Solvents and hazardous waste	Transpacific Technical Services, Seaview	
Used oil	Seaview Transfer Station, Seaview	
	Thurline Transport Services, Seaview	

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HUTT CITY COUNCIL
SILVERSTREAM LANDFILL
LISTED SPECIAL WASTE DISPOSAL DECLARATION

IMPORTANT INFORMATION

1. Complete this Disposal Declaration in full.
2. 24 hours' prior notification is required for landfill disposal of Listed Special Wastes. Please telephone the Landfill Manager on (04) 563-6952.
3. The completed Disposal Declaration must be given to the kiosk attendant on arrival at the landfill.
4. Random sampling and analysis of wastes will be carried out to ensure compliance with the Disposal Declaration.

Waste Generator to complete:

Waste Generator Name: _____

Waste Type: _____

Approx. Quantity: _____

I declare that the contents of this load to be disposed are listed special wastes

Signature: _____ Date: _____

Transporter to complete:

Transport Company: _____ Vehicle No.: _____

Driver's Signature: _____ Date: _____

Landfill Staff to complete:

Kiosk operator signature: _____ Date: _____

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PRIVACY ACT STATEMENT

I/We acknowledge that:

1. Personal information concerning me/us provided to Hutt City Council ("the Council"), whether contained in this application or otherwise obtained is provided and may be held, used and disclosed by the Council:

   (a) to enable the Council to communicate with me/us for any purpose;

   (b) to enable the Council to provide me/us, or have provided to me/us, advice and information concerning products and services that the Council believes may be of interest to me/us;

   (c) to enable the Council to administer and maintain its records and carry out its required functions.

2. The personal information provided in this application is collected by and will be held by the Council, whose address is Private Bag 31912, 30 Laings Road, Lower Hutt.

3. If I/we fail to provide any of the information the Council may be unable to process the application.

4. I/we have the right under the Privacy Act 1993 to obtain access to and to request correction of any personal information held by the Council concerning me/us.

Council has a Privacy Officer. If you have any concerns regarding privacy issues please telephone 570-6736.

_____

(Please sign)

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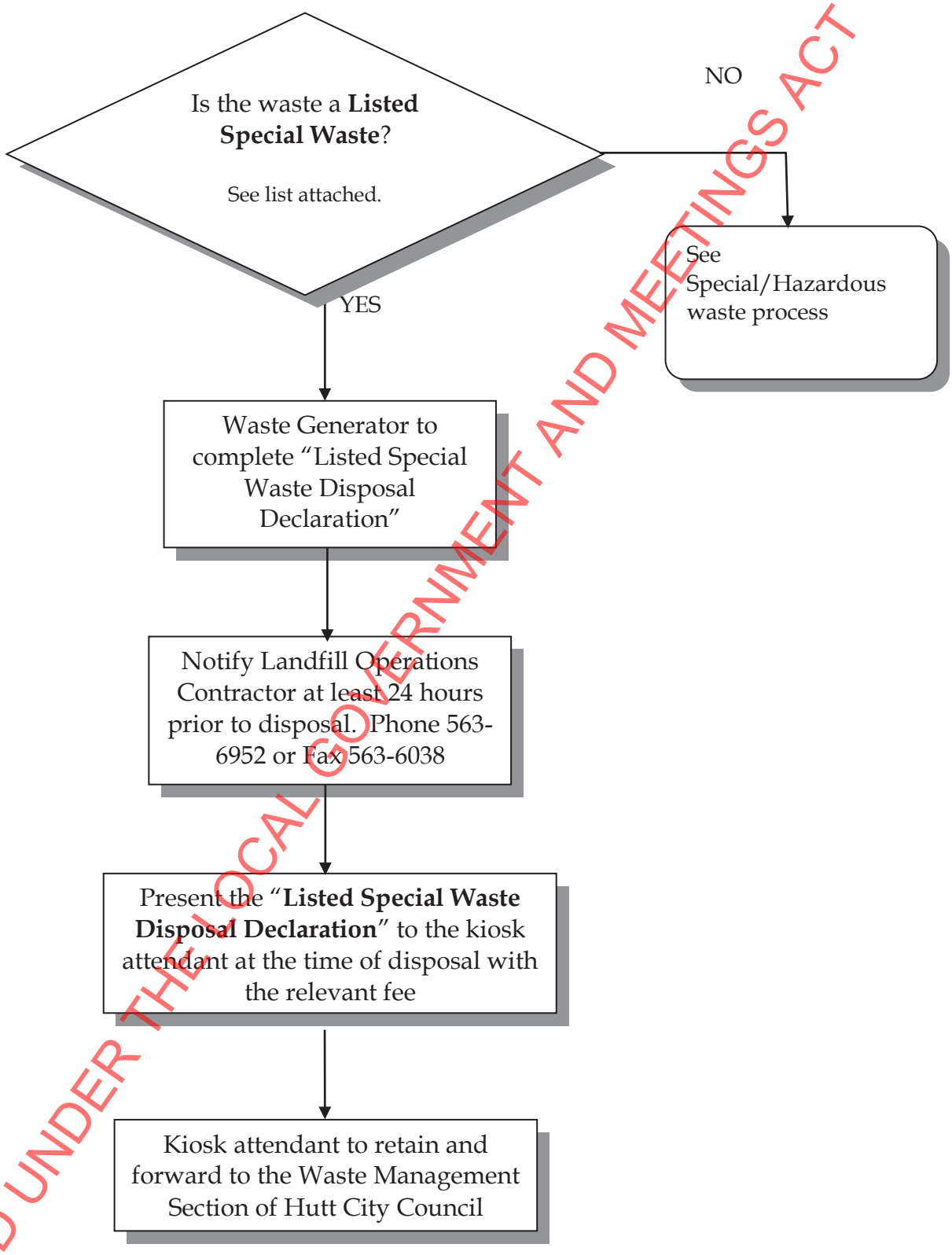
Listed Special Wastes Acceptance process



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NOTES ON LISTED SPECIAL WASTE

Special wastes require special handling, burial, pre-treatment or testing before they can be accepted for landfill disposal.

Listed Special Wastes are generally non-hazardous but require immediate burial, and can be visually verified as non-hazardous and/or suitable for landfill disposal. Listed Special Waste will be accepted upon completion of a "*Listed Special Waste Disposal Declaration*".

Listed Special Wastes include:

- Asbestos waste, including building demolition, maintenance or cleaning, wallboard, roofing, wall and ceiling spray coverings and pipe insulation. The asbestos must be thoroughly wetted (or modified by a bonding agent or coating) and packaged in accordance with the Health and Safety in Employment (Asbestos) Regulations 1998.
- Commercial products or chemicals and their containers that are off-specification, outdated or unusable, provided they are visually identifiable and non-hazardous.
- Empty containers that once held hazardous substances. Containers must be empty according to label directions, triple rinsed with an appropriate solvent or cleaned by an equivalent method and rendered unusable. All drums must be crushed prior to disposal.
- Commercial wastes from non-manufacturing, retail and wholesale businesses, warehousing, service and transportation activities.
- Industrial and manufacturing non-hazardous wastes.
- Wire rope and steel formed sections longer than 1 metre.
- Bulky industrial and commercial items such as large construction materials or components.
- Commercially sensitive non-hazardous materials that require witnessed burials (e.g. police files and confidential records).
- Aesthetically disturbing materials such as dead animals.
- Dust, including cereal dusts, carpet and wool dusts and carbon black/soot.
- Odorous non-hazardous waste.
- Sludges with no free liquid present, greater than 20% solid content, a slump of less than 200mm, arising from:
    - Septic tanks, food service grease traps, Laundromats and car washes.
    - Water treatment plants
    - Sewage treatment plants (Silverstream Landfill only).

NOTE: Special wastes that **cannot** be visually identified or verified as non-hazardous wastes will be treated as hazardous wastes and an "*Application for Disposal of Special/Hazardous Waste*" form must be completed before these wastes are accepted for disposal. Such wastes will frequently require pre-acceptance testing for chemical composition to determine whether they are within the acceptance criteria for hazardous waste outlined in this guide

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SILVERSTREAM LANDFILL
APPLICATION FOR DISPOSAL OF SPECIAL/HAZARDOUS WASTE

Conditions for the Acceptance of Special/Hazardous Wastes at Silverstream Landfill

1. This form is for wastes having characteristics as described in Table H; or of a waste type listed in Table YA; or containing constituents listed in Table YB (tables attached).
2. Customer / Generator to complete this application as fully as possible and send to the HCC Solid Waste Consultant Tonkin & Taylor (T&T) on fax (04) 381-2908 or email well@tonkin.co.nz. For any queries please phone (04) 381-8560.
3. T&T will determine the acceptability of the waste or adequacy of the information provided. T&T will advise the customer/generator if additional analytical testing or other data are needed.
4. T&T will send notification of approval. A copy of the approval must accompany each load to the landfill.
5. After approval, contact Silverstream Landfill Manager (04) 563-6952, giving 24 hours notice of proposed delivery. Loads will only be accepted dependent on weather conditions.
6. Random sampling and analysis of wastes may be carried out to ensure compliance with the HCC Landfill Waste Disposal Guide.
7. Should a generator, waste disposal contractor or transporter fail to comply with this notice then special/hazardous wastes may no longer be accepted for disposal from that person or company.
8. Any person discharging or depositing undeclared hazardous waste into or onto a landfill may be prosecuted.

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HUTT CITY COUNCIL: APPLICATION FOR DISPOSAL OF SPECIAL/HAZARDOUS WASTE

1 Generator information **Application No:**

1.1 Generator's Name: _____ 1.4 Phone: _____

1.2 Contact Person: _____ 1.5 After-hours: _____

1.3 Business Address: _____ 1.6 Fax: _____

2 Waste Information

2.1 Description of the waste: _____

2.2 Location where waste generated: _____

2.3 Current storage location: _____

2.4 Process involved in generating the waste: _____

2.5 Batch number/date waste generated: _____

2.6 Is this waste treated hazardous waste? YES/NO

If yes, describe the treatment: _____

2.7 Safety and handling instructions: _____

2.8 Estimated quantity (litres or kg): _____

2.9 Packaging method:

3 Waste Characteristics

3.1 Physical characteristics of the waste (e.g. solid, powder, sludge, etc.): _____

3.2 Is the waste odorous? YES/NO

3.3 Does the waste exhibit any of the characteristics listed in attached Table H? YES/NO

If YES, specify which ones: _____

3.4 Is the waste type listed in attached Table YA? YES/NO

If YES, specify which type: _____

3.5 Does the waste contain any of the constituents listed in attached Table YB? YES/NO

If YES, specify which ones: _____

What are the concentrations of these constituents (e.g., %, mg/kg)? (attach supporting documents such as analytical certificates, TCLP results, MSDS, etc)

4 Certification

I hereby certify that the above and attached description is complete and accurate to the best of my knowledge. No deliberate or wilful omissions of waste composition, properties or quantities exist and all known or suspected hazards have been disclosed.

Signature: _____ Date: _____

Name: _____ Position: _____

Please fax or email completed form to Tonkin & Taylor: (04) 381-2908 or well@tonkin.co.nz

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TABLE H: LIST OF HAZARDOUS CHARACTERISTICS

UN Class*	Code	Characteristics
1	H1	Explosives An explosive substance or waste is a solid or liquid substance or waste (or mixture of substances or wastes) which is in itself capable by chemical reaction of producing gas at such a temperature and pressure and at such a speed as to cause damage to the surroundings.
3	H3	Flammable Liquids The word "flammable" has the same meaning as "inflammable". Flammable liquids are liquids, or mixtures of liquids, or liquids containing solids in solution or suspension (for example, paints, varnishes, lacquers, etc, but not including substances or wastes otherwise classified on account of their dangerous characteristics) which give off a flammable vapour at temperatures of not more than 61 deg. C.
4.1	H4.1	Flammable Solids Solids, or waste solids, other than those classed as explosives, which under conditions encountered in transport are readily combustible, or may cause or contribute to fire through friction.
4.2	H4.2	Substances or Wastes Liable to Spontaneous Combustion Substances or wastes which are liable to spontaneous heating under normal conditions encountered in transport, or to heating up on contact with air, and being then liable to catch fire.
4.3	H4.3	Substances or Wastes which, in Contact with Water, Emit Flammable Gases
5.1	H5.1	Substances or wastes which, by interaction with water, are liable to become spontaneously flammable or to give off flammable gases in dangerous quantities.
5.1	H5.1	Oxidizing Substances Substances or wastes, which while in themselves not necessarily combustible, may, generally by yielding oxygen cause, or contribute to, the combustion of other materials.
5.2	H5.2	Organic Peroxides Organic substances or wastes which contain the bivalent-o-o-structure are thermally unstable substances which may undergo exothermic self-accelerating decomposition.
6.1	H6.1	Poisonous Substances Substances or wastes liable either to cause death or serious injury or to harm human health if swallowed or inhaled or by skin contact.
6.2	H6.2	Infectious Substances Substances or wastes containing viable micro organisms or their toxins which are known or suspected to cause disease in animals or humans.
7	H7	Radioactive Material Spontaneously emits radiation greater than background level. Includes alpha, beta, gamma, x-rays, neutrons, high energy electrons, protons, other atomic particles.
8	H8	Corrosives Substances or wastes which, by chemical action, will cause severe damage when in contact with living tissue, or, in the case of leakage, will materially damage, or even destroy, other goods or the means of transport; they may also cause other hazards.
9	H10	Liberation of Toxic Gases in Contact with Air or Water Substances or wastes which, by interaction with air or water, are liable to give off toxic gases in dangerous quantities.
9	H11	Toxic (Delayed or Chronic) Substances or wastes, which, if they are inhaled or ingested or if they penetrate the skin, may involve delayed or chronic effects, including carcinogenicity.
9	H12	Exotoxic Substances or wastes which if released, present or may present, immediate or delayed adverse impacts to the environment by means of bioaccumulation and/or toxic effects upon biotic systems.
9	H13	Capable, by any means, after disposal, of yielding another material, e.g., leachate, which possesses any of the characteristics listed above.

*Corresponds to the hazard classification system included in the United Nations Recommendations on the Transport of Dangerous Goods (ST/SG/AC.10/1/Rev.6, United Nations, New York, 1989)

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TABLE YA: HAZARDOUS WASTE TYPES

WASTE TYPES		LIKELY SOURCES
Y1	Clinical wastes	Hospitals, public and private, medical clinics, emergency clinics, day hospitals, veterinary clinics, medical schools, mortuaries
Y2	Pharmaceutical production	Manufacture and formulation of pharmaceutical products. Chemist shops and related formulators
Y3	Redundant drugs and medicines	As for Y1 and Y2 (hospitals, clinics, rest homes).
Y4	Waste biocides and phytopharmaceuticals	Manufacture of herbicides, weedkilllers; insecticides and plant growth regulators; warehouses, stock and station agents and suppliers of these materials; Commercial users and applicators
Y5	Wood preserving chemicals	Formulators and suppliers of copper, chromium and arsenic, and other permanent wood treatment agents, derivatives of pentachlorophenol, quinolates and other antisapstain agents, and other wood preserving or non decorative protecting materials.
Y6	Organic solvents	Manufacturers and users, most organic chemical manufacturers, formulators and commercial users. Paint, ink, resins, etc.
Y7	Heat treatment cyanides	Metallurgical industries with special heat treatment facilities. Spring makers, etc
Y8	Waste mineral oils	Motor vehicle and other engine workshops Bus depots and bases for machinery contractors Waste oil collecting bases and re-refining activities
Y9	Waste oil, hydrocarbon, water mixtures and emulsions	Port facilities for bilge contents Sources for Y6 and Y8 above Cutting oils and wastes from metalworking operations Sumps and interceptor maintenance
Y10	PCBs, PCTs, PBBs	Waste substances or articles containing or contaminated with dielectric fluids in electrical equipment or hydraulic fluids. Manufacture of non-carbon copying paper
Y11	Tarry residues	Oil re-refining; carbonising processes; pyrolytic processes Distillation bottoms
Y12	Paints, inks, dyes, pigments,	Inks, including printing operations Lacquers, varnish, etc. dyes formulation and use Paint pigment, lacquers or varnish formulation and manufacture
Y13	Resins, glues, adhesives, latex, plasticisers, etc	Plastic product manufacturers Chemical manufacturers Plastic boat/pool fabricators
Y14	Waste chemical substances	Universities, polytechnics, secondary schools; hospital laboratories arising from research and research centres, development or teaching activities
Y15	Explosive wastes	Quarry operations, contractors. Processes using organic peroxides and other highly reactive materials
Y16	Photographic chemicals	Chemical manufacturers/supplies; film and processing materials production/laboratories Film processors
Y17	Surface treatment of metals and plastics	Galvanising, anodising, powder coating. Other surface treatment and processes
Y18	Residues from industrial waste disposal operations	On site and off site treatment processes
Y46	Wastes collected from households	
Y47	Residues arising from the incineration of household wastes	

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TABLE YB: HAZARDOUS CONSTITUENTS

Code	Constituent
Y19	Metal carbonyls
Y20	Beryllium; beryllium compounds
Y21	Hexavalent chromium compounds
Y22	Copper compounds
Y23	Zinc compounds
Y24	Arsenic; arsenic compounds
Y25	Selenium; selenium compounds
Y26	Cadmium; cadmium compounds
Y27	Antimony; antimony compounds
Y28	Tellurium; tellurium compounds
Y29	Mercury; mercury compounds
Y30	Thallium; thallium compounds
Y31	Lead; lead compounds
Y32	Inorganic fluoride compounds
Y33	Inorganic cyanides
Y34	Acids
Y35	Bases
Y36	Asbestos (dust and fibres)
Y37	Organic phosphorus compounds
Y38	Organic cyanides
Y39	Phenols, phenol compounds including chlorophenols
Y40	Ethers
Y41	Halogenated organic solvents
Y42	Other organic solvents
Y43-44	Polychlorintaed dibenzo furans or dioxins
Y45	Other organohalogen compounds
Y48	Radioactive substances
Y49	Contained gases
Y50	Contaminated soils from remediated sites

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Group	Contaminant	Screening Criteria = 20x TCLP (mg/kg)	TCLP Threshold (mg/L)	Source of TCLP criteria [1]
Inorganics	Antimony	40	2	c
	Arsenic	100	5	a
	Barium	200	10	b
	Beryllium	20	1	a
	Boron	2800	140	c
	Cadmium	20	1	a
	Chromium(VI)	100	5	a
	Copper	28	1.4	d
	Lead	100	5	a
	Mercury	4	0.2	a
	Molybdenum	100	5	a
	Nickel	40	2	a
	Selenium	20	1	a
	Silver	100	5	a
	Zinc	160	8	d
	Fluoride	3000	150	a
Petroleum hydrocarbon	Benzene	10	0.5	a
	Toluene	280	14	a
	Ethylbenzene	600	30	a
	Xylene	1000	50	a
	Naphthalene	1	0.05	b
Substituted aromatics	Aniline	100	5	b
	Styrene	60	3	a
	1,2-Dichlorobenzene	86	4.3	a
	1,2,3-Trichlorobenzene	20	1	c
	1,2,4-Trichlorobenzene	10	0.5	c
	Phenol	280	14	a
	2-Chlorophenol	0.4	0.02	b
	2,4-Dichlorophenol	0.4	0.02	b
	2,4,6-Trichlorophenol	40	2	a
Chlorinated solvents	Dichloromethane	172	8.6	a
	1,1,1-Trichloroethane	600	30	a
	1,1,2-Trichloroethane	24	1.2	a
	Vinyl chloride	4	0.2	a
Pesticides	2,4-D	200	10	a
	Aldrin	0.02	0.001	d
	Dieldrin	0.08	0.004	c
	Endosulfan	4	0.2	b
Other	Tributyltin	0.04	0.002	d

Note 1:

a - NSW EPA (1999) *Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-*

b - NZS 9201:Part 23 Trade Waste (2004), *Model General Bylaws*

c - MoH, 2005 *New Zealand Drinking Water Standards* . Values x100.

d - ANZECC (2000) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality - freshwater, 95% level of protection. Values x1000.*

Explanation to table

The principal test used for assessing chemical constituents of waste material is the Toxicity Characteristic Leaching Procedure (TCLP). This estimates the potential for the waste to release contaminants into landfill leachate.

The Screening Criteria in the table are derived from the TCLP values. If a waste has contaminant concentrations below the Screening Criteria, it is not possible for the TCLP criteria to be exceeded.

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Use of acceptance criteria table by disposers

The following process can be used to determine whether a waste material will meet the hazardous waste acceptance criteria for Silverstream Landfill:

- If the contaminant concentration in the waste is below the screening criteria, then TCLP testing is not required and the waste will be accepted, providing other relevant criteria are met (e.g., physical characteristics of waste).
- If the contaminant concentration in the waste is above the screening criteria, then TCLP testing is required. If the TCLP result is below the acceptance guidelines, then the waste will be accepted providing other relevant criteria in the Landfill Waste Acceptance Policy have been met.
- If the TCLP result exceeds the acceptance guideline, then the waste will need to be treated, as appropriate, to reduce this level to below the limit.

Immobilisation of chemical contaminants

Immobilisation of a contaminant in waste may be the result of a specific treatment process that the waste has been subjected to, or it may be a natural physical or chemical property of that type of waste.

Waste generators/disposers will need to seek approval from HCC of the immobilisation of specified contaminant(s) contained in a particular type of waste. Approval will be considered on a case by case basis on the production of supporting evidence.

The preferred treatment options for waste involve the removal or destruction of the toxic contaminants to achieve leachable levels below the acceptance limits. Dilution without achieving immobilisation of contaminants is not an acceptable waste treatment option.

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Appendix D: Silverstream Landfill Stage 2 Engineering Report

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REPORT

HUTT CITY COUNCIL

Silverstream Landfill Stage 2
Phase 1 Base, Slopes 1 & 2
Design Report

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Report prepared for:

HUTT CITY COUNCIL

Report prepared by:

TONKIN & TAYLOR LTD

Distribution:

HUTT CITY COUNCIL	copies
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July 2006

Job no: 83091.402

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1 Introduction

1.1 The Phase 1 development

The Stage 1 development at Silverstream Landfill (SS1) has been in operation for over 30 years. The operation life of the landfill has been extended by the development of additional void (commencing in 1996) on top of the Stage 1 top platform (Stage 1A). However, this additional void is substantially utilised.

The Stage 2 development is located immediately down valley and will partly overlay the front face of the existing landfill. It will be developed in five phases over a period of thirty to forty years, depending on the rate of void space utilisation. The first Phase is scheduled to commence receiving waste in January 2008.

The Phase 1 development for Stage 2 includes formation and lining works for a plan area of 4.8 hectares immediately downstream of SS1. It includes approximately 1.1 hectares of base area and 6 hectares of slopes.

1.2 The design

This design report presents the detailed design for the Base, Slopes 1 and 2 of the Phase 1 development of Stage 2. Drawing sets 83091.300 (enabling works) and 83091.400 (Phase 1 slopes 1 & 2) have been included in Appendices H and I respectively at a reduced scale.

This report covers the principal elements of the construction works up to the point of refuse acceptance. These elements include:

- Base formation geometry;
- Groundwater drainage system;
- Interface with the SS1 groundwater and leachate management systems;
- Liner system;
- Leachate management system;
- Temporary toe bund;
- Stability analysis; and
- Temporary surface water control.

Operational components, final cap design, permanent surface water drainage and landfill gas management systems are outside the scope of this report.

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1.3 The construction works

The Works described in this report are to be undertaken under two separate construction contracts:

- Contract No AD16-3559 Silverstream Landfill Phase 1 Enabling Works.
- Contract No AD16-3624 Silverstream Landfill Phase 1 formation and liner construction – Base, Slopes 1 & 2.

The Enabling Works contract includes the construction of formation, leachate collection and perimeter surface water system works. The works are shown on Drawing Numbers 83091.300-GEN001 to GEN002, FOR101-FOR107, LCS401-402, SUR523-545 (Appendix H). The design of the formation and leachate collection works are included in this design document. The design of the perimeter surface water system is outside the scope of this report.

The Phase 1 formation and liner contract includes the construction of formation, liner, leachate collection systems and a temporary toe bund. The Works are shown on Drawing Numbers 83091.400-GEN001 to GEN004, FOR101 to FOR115, LNR201 to LNR206, LCS301 to LCS303 and TOE401 to TOE410 (Appendix I). The design of all components shown on these drawings is included in this design report.

1.4 Geotechnical investigations

The geotechnical investigations undertaken as part of the Phase 1 design process are summarised in the "Silverstream Landfill Phase 1: Earthworks/Liner Construction Geotechnical Investigations Report", together with the design of the maximum temporary and permanent cut and fill slopes. The recommendations provided in the Geotechnical Report are incorporated in the design of the Phase 1 Base, Slopes 1 & 2.

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2 Permits and consents

Three discharge permits, four water permits and seven land use consents were issued by The Wellington Regional Council to Hutt City Council for the Development of Stage 2 of the Silverstream Landfill.

A summary of these permits and consents is provided in Table 2.1.

Table 2.1 Permit and consent summary

Consent Number	Expiry date	Purpose
WGN040184 [23248]	13 May 2039	To discharge waste, fugitive leachate and other site-generated liquid to land, in circumstances where contaminants may enter water.
WGN040184 [23249]	13 May 2039	To discharge landfill gas, exhaust gases, dust, odour and other contaminants to air from a landfill.
WGN040184 [23250]	13 May 2039	To dam and divert Tip Stream for the purposes of creating a sedimentation pond.
WGN040184 [23251]	13 May 2039	To discharge uncontaminated stormwater, groundwater and treated stormwater from a sedimentation pond to Tip Stream.
WGN040184 [23253]	13 May 2039	To construct a sedimentation pond, dam, lined channel and drop structures in the bed of Tip Stream.
WGN040184 [23254]	13 May 2039	To divert ephemeral streams and existing drains to a sedimentation pond.
WGN040184 [23256]	13 May 2039	To construct diversion structures in the beds of tributaries of Tip Stream for the purpose of stormwater management.
WGN040184 [23257]	13 May 2014	To take fresh water from Tip Stream (via a sedimentation pond) for dust control and ancillary purposes.
WGN040184 [23258]	13 May 2014	To take groundwater from beneath the landfill via monitoring bores or through collection of underdrainage.
WGN040184 [23259]	13 May 2039	To undertake earthworks associated with the formation of roads and tracks.
WGN040184 [23260]	13 May 2039	To excavate the floor and side slopes of the landfill and to operate borrow areas for the supply of construction and cover materials.
WGN040184 [23261]	13 May 2039	To clear vegetation from the landfill footprint, access roads, drains and the borrow area.
WGN040184 [23262]	13 May 2039	To construct bores for monitoring groundwater quality.
WGN040184 [23263]	Unlimited	To reclaim a section of Tip Stream for landfilling purposes.

The design of the Phase 1 Base, Slopes 1 & 2 as taken into account the requirements of these consents and permits.

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3 Earthworks

3.1 Excavation classification system

An excavation classification system has been developed for the Silverstream Stage 2 Landfill. The justification for this classification system is included in the "Silverstream Landfill Phase 1: Earthworks/Liner Construction Geotechnical Investigations Report".

The purpose of the classification system is to provide guidelines for design of the cut and fill slopes of the Phase 1 development, including:

- Maximum batter angles;
- Maximum bench spacing and
- The liner subgrade conditions.

Six excavation classes have been identified and are summarized in Table 3.1.

There are three soil classes: non-engineered and unsuitable natural soils (Class 1A), engineered fill and natural soils (Class 1B) and rock fill (Class 1C).

There are pre-existing areas of non-engineered, engineered fill and natural soils on the site and there will be cut slopes formed in these materials. General engineered fill and rock fill will be constructed as part of the Stage 2 works.

There are three classes of rock (Class 2, 3 and 4) divided on the basis of weathering grade. In general terms, the less weathered the rock, the steeper the slopes can be cut.

The cut slope angles are based on both site observations and experience of greywacke slopes elsewhere in the Wellington Region. These slope angles are conservative and will be stable in most cases, but there will be situations where unfavourably orientated joints/faults combine to create locally unstable sections of slopes. In these areas, the slopes will need to be either flattened or retained.

Figure 3.1 shows maximum temporary and permanent cut slope angles for different weathering grades of rock. Permanent cuts on the lower slopes will be largely in moderately and less weathered rock and those on the upper slopes will be in more variable materials including fill, natural soil and all grades of weathered rock.

3.2 Subgrade deterioration

In all material classes, the finished surfaces will deteriorate with time. Stress relief, surface erosion and shrink/swell will result in rilling and small-scale drop outs from cut faces. In rock cuts, interbedded sandstone/siltstone/mudstone units are more prone to deterioration than massive sandstone/siltstone units. To minimize deterioration of the slopes with exposure to the atmosphere bulk excavation could be under-excavated to above the finished subgrade profiles, as illustrated on Figure 3.1, and the slopes should only be trimmed to their final profile immediately prior to liner placement.

On fill slopes, surface erosion and softening of fill is inevitable. This can be minimised by sealing fill with smooth drum compactors, grading of fill surfaces and providing diversion drains around fill areas. Alternatively a temporary sacrificial layer of fill could be provided.

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Table 3.1 Excavation type classification

Classification	Description	Subgrade suitability / preparation	Permanent Slopes			Temporary Slopes	
			Individual slope (V on H)	Maximum vertical bench spacing (m)	Overall slope >6m	Individual batter slope (V on H)	Maximum vertical bench spacing (m)
Class 1A	Non-engineered fill, and unsuitable natural soils	Will not be suitable for liner subgrade. Excavate and replace with engineered fill.	NA	NA	NA	NA	NA
Class 1B	General engineered fill and suitable soils.	The existing engineered fill will be suitable as liner subgrade subject to inspection and testing and remedial work if required.	Fill 1V on 2H	6.0m	1V on 2.5H	As for permanent slope	
Class 1C	Rockfill, using MW and less weathered rock	Batters can be steepened with geogrid reinforced fill.	Fill 1V on 1.5V	6.0m can be increased for reinforced fill	30°	As for permanent slope	
Class 2	Extremely weathered greywacke rock	Will require minimal dental work to form smooth subgrade	Cut 1Von 1H	6.0m	35°	Cut 1V on 0.67H	6.0m
Class 3	Highly weathered greywacke rock	Will require some dental work to form a smooth subgrade.	Cut 1V on 0.67H 1V on 0.5H	6.0m	40° to 45°	Cut 1V on 0.5H	12.0m
Class 4	Moderately to unweathered greywacke rock	Will require significant dental work to form a smooth subgrade.	Cut 1V on 0.67H 1V on 0.5H depending on joint pattern	6.0m	40° to 45°	Cut 1V on 0.33H	12.0m

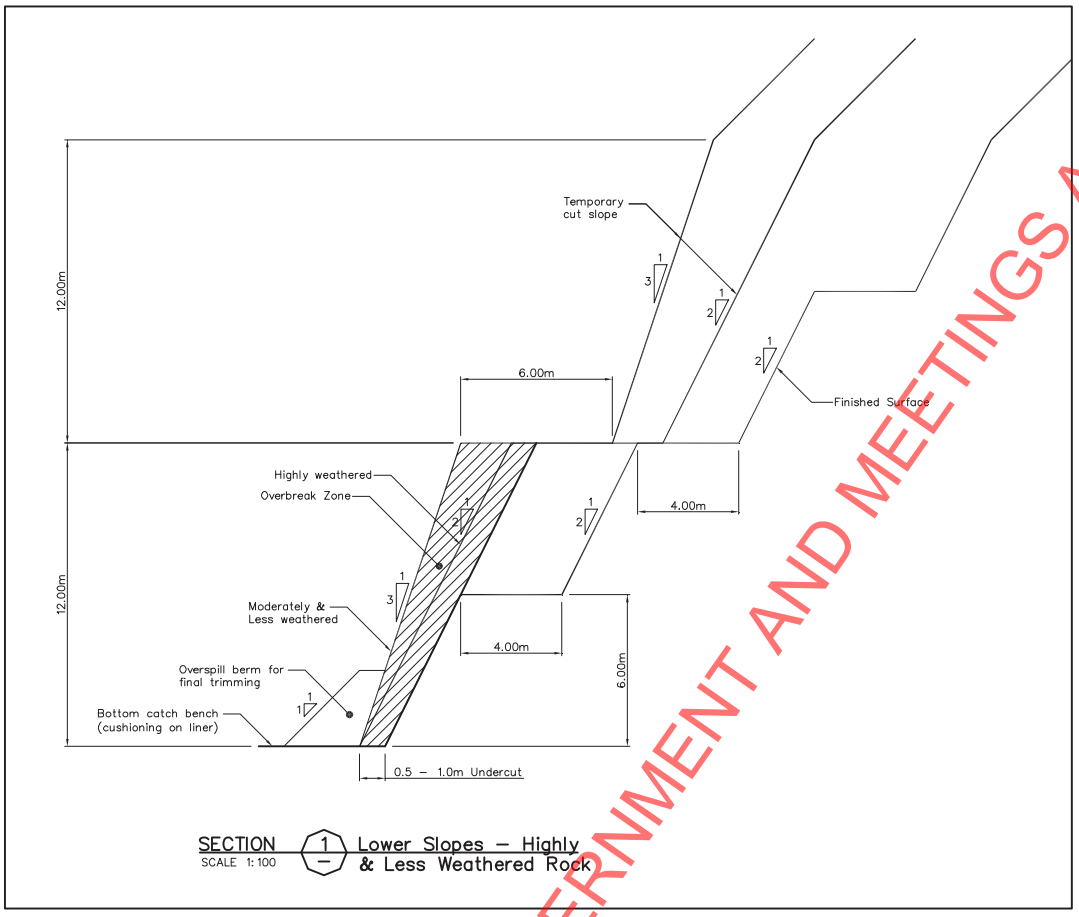

Figure 3.1 Temporary and permanent cut slope design profile

3.3 Importance of uniform formation and slope heights

For the most part, the formation for a landfill should provide a reasonably regular system of slopes and benches progressing up the side slopes of the landfill. Under these circumstances any development of minor tension in the liner system and in particular the HDPE geomembrane is consistent from one area to the next, ensuring little differential stress between adjacent areas. There is therefore no tendency for any area to be over stressed due to differences in tension across features or between different liner areas.

The formation geometry has been specifically designed to avoid sudden changes in slope profile which may give rise to an uneven stress distribution within the liner system. Typically the transition zone between steep cut slopes (1 vertical on 0.5 horizontal) and shallower cut slopes (1 vertical on 2 horizontal) is 30 metres long thereby allowing a gradual change in the slope gradient. Once a cut slope of 1 vertical on 2 horizontal is achieved, the slope can then progress from cut into fill. This ensures that fill material is not placed at steeper than 1 vertical on 2 horizontal. In addition, wherever possible abrupt concave and convex profiles have been avoided.

In the gullies, W1 and E2 (Drawing Number 83091.400-GEN003), where the required length of transition from cut to fill potentially compromises the ability to maintain a smooth slope profile, rock fill is used to enable a 1 vertical on 1 horizontal fill profile. This reduces the change in slope between cut and fill and hence the required transition length is reduced enabling a smooth profile to be maintained.

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4 Groundwater drainage system

4.1 Overview

Groundwater drainage is required beneath the landfill lining system to avoid uplift pressures on the liner that may affect either construction or long term stability.

This section of the report provides a summary of the design of this element of the works.

4.2 Groundwater conditions

The locations of groundwater seepages are shown on Figure 4.1. Seepages typically occur in the following situations:

- In the side gullies and on the floor of Tip Stream;
- Within permeable (no fines) layers within alluvial and colluvial surface soils in the gullies; and
- Associated with zones of closely jointed / shattered rock adjacent to crushed and shear zones.

All groundwater flows observed are relatively minor and many are temporary (ephemeral) flows associated with major rainstorms.

4.3 Groundwater seepage flows

An assessment of the likely groundwater flows from the gullies and other groundwater sources has been made from observations taken on site and a review of the groundwater and surface water flow data. Site observations were made after significant rainfall events during the winter of 2005. The resulting groundwater flows at specific locations are shown on Figure 4.1.

The majority of the groundwater flow in the base of the Phase 1 area arises from flows in the gullies. The combined design groundwater flow at the downstream end of Phase 1 has been taken as 8.4 litres per second, for a factor of safety of 4, and is taken as the design condition for all components of the groundwater drainage system for Phase 1. The adoption of this value is considered conservative as the value is derived from the downstream end of the Phase 1 development and is therefore an accumulation of all groundwater flows arising in the Phase 1 footprint. Notwithstanding this conservative approach, additional factors of safety are applied to the selection of the individual groundwater drainage components as detailed below.

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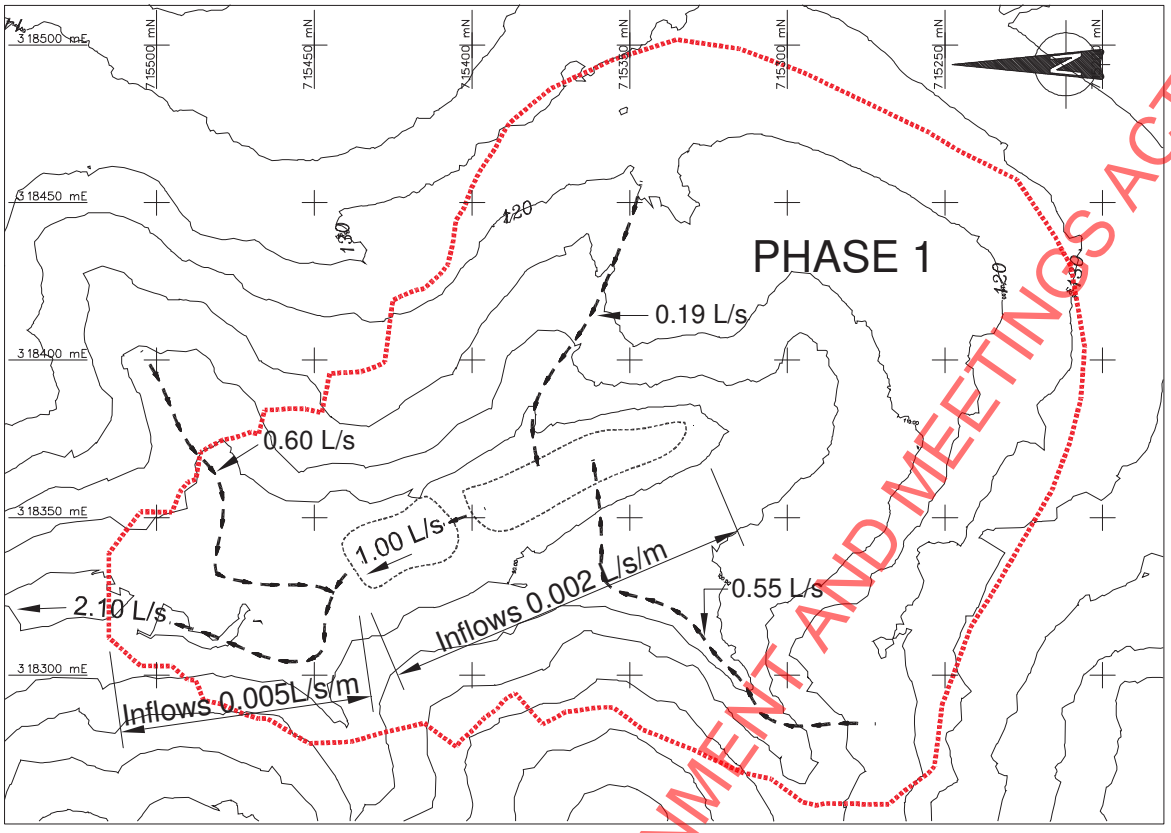

Figure 4.1 Estimated groundwater flows

4.4 Design development

4.4.1 Design objectives

The key objectives of the groundwater drainage design are:

- Interception and control of seepage in the base of the main valley and gully systems to allow fill placement;
- Provision for interception of any unexpected seepage encountered at higher levels; and
- Control of groundwater potential pressures beneath base and slope liner.

4.4.2 Principal design considerations

The factors considered in the detailed design of the groundwater drainage system, were:

- The need to keep the principal groundwater drains as low as possible to provide both construction and long-term dewatering;
- The need to have a robust solution which can accommodate variations in groundwater conditions experienced during construction;
- Accommodation of the discharge between the existing and future landfill developments including the existing groundwater and leachate systems beneath

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the Stage 1/1A landfill (the interface with these systems is discussed in more detail in Section 5); and

- The need for considerable redundancy in the groundwater collection system to accommodate variable flows during operations and potential impacts of seismic activity on the area.

4.4.3 Groundwater drainage components

The groundwater drainage system has three main components, namely:

- Principal groundwater drain in the base of the Phase 1 development;
- Secondary groundwater drain in the base of side gullies; and
- Drainage beneath the liner system.

The design calculations for the groundwater drainage system are provided in Appendix A.

Locations and details of the principal and secondary groundwater drainage components are provided on Drawing Number 83091.300-FOR105. Specific details beneath the liner systems are shown on Drawing Number 83091.300-FOR106 and 83091.300-FOR107.

4.4.4 Seismic considerations

A further factor considered in the design of the groundwater drainage system beneath Stage 2 is that of potential ground rupture of a relic fault trace and potential for that to shear the pipework and drainage material. While this risk is low (T&T Geotechnical Report, 2006), mitigation measures have been introduced in the design by surrounding the principal groundwater pipe in gravel and overlaying this with a rock raft (Drawing Number 83091.300-FOR106).

The hydraulic flow capacity of the combined gravel and rock raft is sufficient to convey both the groundwater and Stage 1 leachate design flows in the unlikely event that the pipes rupture. This is discussed in more detail below.

4.4.5 Construction considerations

The groundwater drainage system has been substantially completed in the base of Phase 1 as part of the Enabling Works. In the initial stages of these construction works problems were encountered in obtaining suitable material from the on site borrow area for the drainage material surrounding the principal drain. Modifications have therefore been made to the groundwater drainage system in the first third of the upstream section of the Phase 1 base area. These modifications are included in this design report for completeness.

4.5 Base and gully drainage design

4.5.1 Flow capacity

The groundwater drainage layer comprises three components:

- 200 mm diameter SDR11 PE 100 perforated groundwater drainage pipe
- 40/20 gravel surround to the perforated pipe
- 300/20 rockfill above the gravel surround

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The calculations included in Appendix A (Calculation 01) demonstrate that the perforated pipe has significantly greater capacity (73 litres per second) than the design flow of 8.4 litres per second.

Notwithstanding this significant level of redundancy in the design, in the unlikely event that the groundwater pipe ruptures in a seismic event, the hydraulic capacity of the gravel surround and rockfill is sufficient to convey the entire design flow (combined groundwater and Stage 1/1A leachate flow of 52.2 litres per second). Therefore, the proposed groundwater collection system is a robust system with significantly greater capacity than the design condition.

4.5.2 Pipe perforation size

The pipe bedding/drainage gravel for the primary leachate drains is a 40/20 gravel. The pipe perforations must be compatible with the grading of the surrounding drainage aggregate and allow free flow into the pipe.

The design calculations in Appendix A (Calculation 02) demonstrate that 13 millimetre diameter perforations at 125 mm spacing meet the hydraulic and filter compatibility requirements.

4.5.3 Pipe strength

The strength of the groundwater drainage pipes has been selected based on wall crushing and buckling criteria. The calculations (Appendix A, Calculation 03 and 04) demonstrate that a SDR 11 PE 100 pipe has an acceptable factor of safety against crushing and buckling with and without taking into account incomplete projection. These calculations are based on a 50 year design life and the design approach proposed by Driscopipe in their pipeline design manual.

4.5.4 Filter considerations

The granular material surrounding the principal groundwater drain and gully drains has been design as a natural gravel filter. However, in the early stages of the Enabling Works the locally available material was not able to meet the criteria set out in the design calculations for a natural gravel filter. The design was therefore modified and a geotextile filtered option provided.

Calculations for the natural gravel filter option and the geotextile option are provided in Appendix A (Calculation 05). Details of these options are shown on Drawing Number 83091.300-FOR106.

4.6 Groundwater drainage beneath liner systems

Additional controlled groundwater drainage systems are provided beneath the liner systems on the steep rock faces and at benches.

Beneath the steep (greater than 1 vertical on 1 horizontal) liner a 150 millimetre thick no fines concrete layer with a minimum hydraulic permeability of 10^{-4} m/s is provided. The no-fines concrete layer has a two fold function:

- To provide a smooth surface on which to place the HDPE geomembrane; and
- To provide adequate drainage beneath the impermeable geomembrane.

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The groundwater collected in the no fines layer is conveyed to a granular drain and perforated pipe located on the benches. The granular drain and pipe daylights at the downstream edge of Phase 1, beyond the toe bund. Therefore, in the very unlikely event that the groundwater drainage system in the base ceases to operate the maximum potential groundwater rise beneath the liner system is 6 metres above the landfill base.

The design of the liner system is sufficiently robust to be unaffected by such a rise in groundwater pressure. Furthermore, as the basal groundwater drainage layer is unlikely to fail in the foreseeable future, the resulting groundwater pressure will potentially only develop once the waste mass has been placed and would be significantly less than the weight of the waste mass in place.

The design of the groundwater drainage system to be provided on the benches is included in Appendix A (Calculation 06).

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5 Interface with the Stage 1/1A groundwater and leachate management systems

5.1 Overview

The existing landfill has rudimentary groundwater and leachate drainage systems. These include low level groundwater drains and low and high level leachate drains. The Stage 1 system consists of a series of pipe drains running up the original gully floor. Stage 1A has a separate system installed above the separation layer between Stage 1 and Stage 1A (Drawing Number 83091.300-LCS401).

Where possible these drains are to be intercepted at the upstream end of Stage 2 and conveyed in solid pipes through the Stage 2 development above the liner system. However, the Stage 1 low level groundwater and leachate systems are below the Stage 2 base liner and therefore are to be conveyed in a solid pipe within the groundwater drainage system beneath Stage 2 (Drawing Number 83091.300-FOR106).

The Stage 1/1A leachate bypass system therefore includes the following features:

- Low level sump at the upstream end of Stage 2 for interception of the low level Stage 1 groundwater and leachate drains;
- Low level bypass pipe beneath the Stage 2 liner system to convey the low level Stage 1 groundwater and leachate flows;
- High level interception trenches beneath the Stage 2 liner where it overlays the front face of the Stage 1/1A waste mass; and
- High level bypass pipe above the Stage 2 liner to convey the high level leachate flows predominantly from Stage 1A leachate drainage system.

The low level sump, low level bypass pipe and the high level bypass pipe will be constructed as part of the Phase 1 Base, Slope 1 and Slope 2 works and therefore their design is included in this document together with an estimation of the total leachate generated from the Stage 1/1A waste mass.

Design calculations are included in Appendix B & C and details are shown on Drawing Number 83091.300-FOR106.

5.2 Stage 1/1A leachate generation

5.2.1 Introduction

The future leachate generation from Stage 1/1A has been estimated to enable the design capacity for the bypass works to be determined.

There is leachate monitoring and rainfall data for the site from 27 September 1998 to 31 March 2006 (Figure 5.1). The early leachate data (September 1998 to May 2002) has significant gaps and appears to be potentially unreliable. Furthermore the leachate flow data recorded for 25 and 29 on February 2004 appears to have been truncated.

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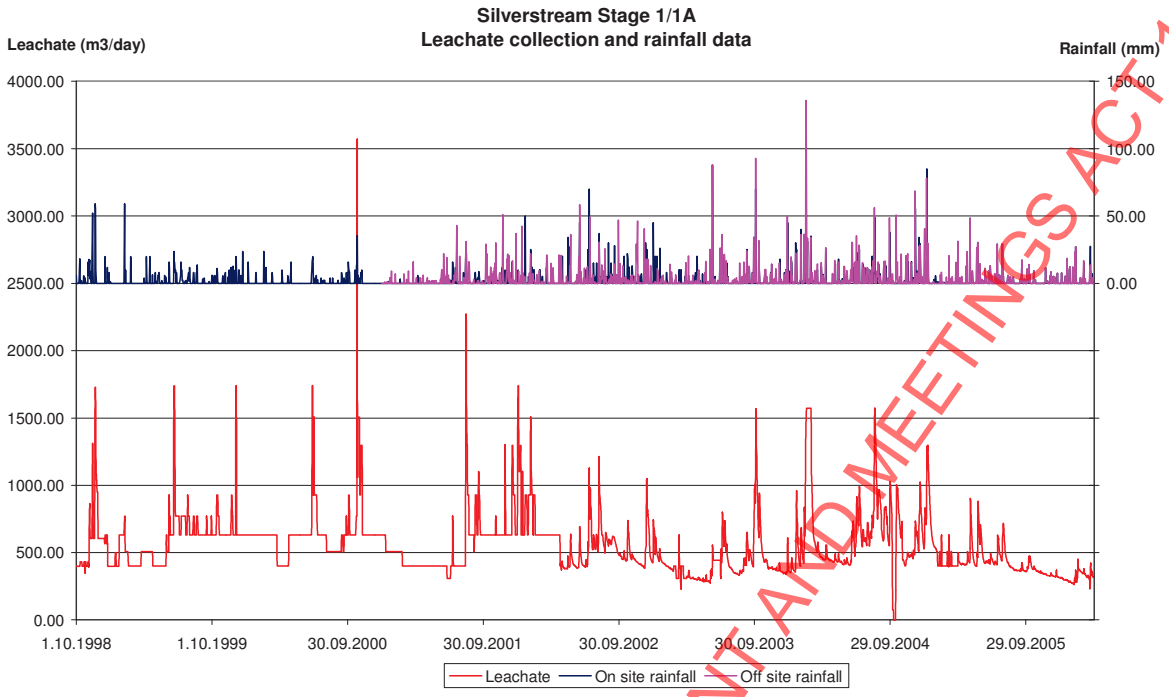

Figure 5.1 Historical leachate and rainfall data

Typically the data is characterised by marked peaks following rainfall events. In the past this has been attributed to ingress of surface water at the edge of the landfill. Works have been carried out at the edge to the waste mass to reduce the amount of surface water ingress into the waste. However the leachate flows still show significant peaks. The existing waste mass is unlined and therefore it is most likely that the continued peaky nature of the leachate flows is due to groundwater intrusion.

There are two aspects to the groundwater flow. The first is relatively shallow subsurface flow which enters the waste mass fairly quickly after a rainfall event. The second is the deeper flow associated with the hydraulic gradient of the groundwater regime. This second response is significantly slower than the first groundwater source.

The Stage 2 landfill will reduce the amount of surface water ingress into the Stage 1/1A waste mass as the Stage 2 footprint covers the front face of Stage 1/1A. It will not have any impact on the groundwater intrusion. The interception system for the Stage 1 leachate needs to be designed to take into account the continued groundwater ingress.

A stochastic cross correlation analysis has been carried out to simulate the response of the leachate regime to rainfall event. The resulting simulated flows have been calibrated against the existing flows and the calibrated model has been used to estimate the future flows.

The calculations are included in Appendix B and a more detailed description of the analysis and results is provided in the following sections.

5.2.2 Rainfall and leachate data

There is intermittent rainfall data recorded at the site from 14 September 1997 to 31 March 2006. The data does not appear to be complete and there are significant gaps in June 1998, May 2001, March/April 2002, March/April 2005 and May 2005 to January 2006.

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The leachate data covers the period from 27 September 1998 to 31 March 2006. There are also gaps in this data and it appears that there may be some truncation of readings. Data is not available for November 2001, March 2002 and June 2003.

In order to carry out a stochastic cross correlation between the rainfall and leachate flow data to determine the response of the leachate regime to individual rainfall events one needs a complete set of data without gaps. The longer the time frame covered by the data the more reliable the correlation is.

The gaps in the leachate data have therefore been eliminated by considering the leachate flows either side of the gap and estimating a flow. Alternative rainfall data has been sourced from the internet for a weather monitoring station in Silverstream (http://homepages.paradise.net.nz/lfduflou/Silverstreamweather.htm).

A stochastic cross correlation between the on site rainfall and leachate flow data for 27 September 1998 to 31 March 2006 (Appendix B1, Calculation 01) and the off site rainfall and leachate flow data for 1 January 2001 to 31 March 2006 (Appendix B2, Calculation 01) has been carried out. The purpose of the analysis is to determine the time period (or lag) over which a rainfall event contributes to leachate flow in the leachate collection system.

Typically for an unlined landfill there are often two distinct lag times:

- Rainfall falling directly on the waste mass.

  Typically for an average landfill of a few hectares or a landfill consisting of cells of less than 10 hectares this is in the order of 1 to 10 days.

- Rainfall on the groundwater catchment upstream of the landfill.

  This second lag depends on the behaviour of the groundwater catchment and can be as short as 10 to 20 days or as long as 120 days depending on catchment characteristics and natural storage.

The statistical analysis of the on site rainfall data (Appendix B1, Calculation 01) compared against the leachate flow data does not give a clearly defined groundwater catchment lag. However, the cross correlation with the off site rainfall data (Appendix B2, Calculation 01) and the leachate flow data indicates interaction between the response of the groundwater and waste mass. It appears that the rainfall falling on the waste mass on a particular day has an influence on the leachate flows for approximately 20 days. The same rainfall event falling on the groundwater catchment influences the leachate flows for approximately 12 days, but it experiences a lag of 23 days before this influence is observed. In other words, the rain falling on the groundwater catchment contributes to leachate flow data from day 23 to day 35 after the rainfall event.

5.2.3 Simulation of leachate flows

The lag values can be used to simulate leachate flow data (Figure 5.2, Appendix B2, Calculation 02).

The simulation assumes that the active filling area is in the order of 1 hectare and that approximately 6 hectares of the Stage 1/1A landfill has a short term interim soil cover with a infiltration factor of 13 percent and 10 hectares has a long term soil cover with an infiltration factor of 5 percent. The groundwater catchment is taken as 35 hectares with and infiltration of 15 percent.

The leachate derived from rainfall on the groundwater catchment area is a result of shallow subsurface groundwater flows infiltrating the unlined waste mass as mentioned

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above. The relatively high infiltration rate (15%) is due to the fractured nature of the rock mass upstream of the landfill.

The existing flow data shows that there is a significant base flow in the Stage 1/1A leachate collection system and this has been estimated as 250 cubic metres per day. The base flow is most likely to be a result of the deeper groundwater flows.

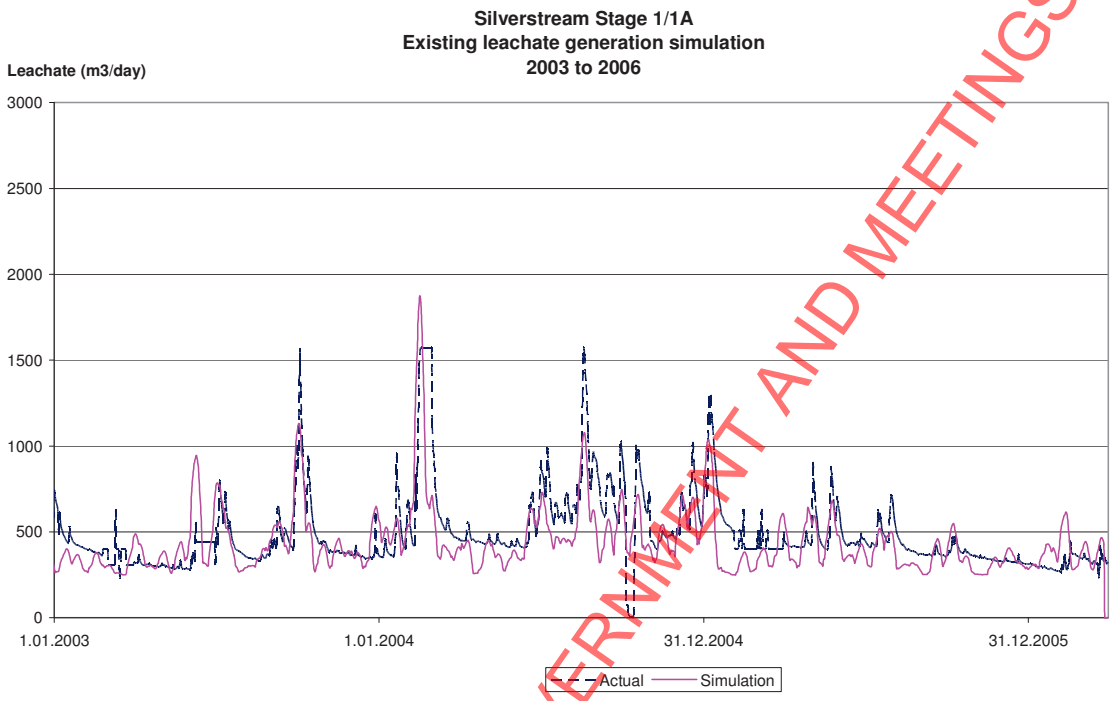

Figure 5.2 Leachate generation simulation from off site rainfall

Figure 5.2 shows that the simulation correlates well with the recorded leachate flows for January 2003 to April 2005 apart from a short period in May 2004 when the flow readings appear to have been truncated. The correlation between the simulated and flow data for 2001 to 2002 is not as good and is most likely to be a direct result of the surface water intrusion which was known to occur at this time prior to the installation of cut off drains at the perimeter of the landfill and the large open tipping area. The simulated flow data for April 2005 to March 2006 shows a significantly greater response to rainfall data than the recorded flows. This suggests that the measures implemented to restrict surface water intrusion directly into the waste mass are starting to have a significant impact and leachate flows in the future may show less immediate response to rainfall events.

Having established a reasonably reliable simulation it is possible to predict the future leachate flows following completion of the Stage 1/1A landfill and the installation of the liner system on the front face as part of the Stage 2 works (Appendix B2, Calculation 03). In the post closure simulation it has been assumed that all surface water infiltration on the landfill has been eliminated beneath the Stage 2 footprint and that only 7.5 hectares of waste mass is left with a long term cover with an infiltration of 5 percent. The groundwater assumptions derived from the correlation with the existing system are left unchanged. The off site rainfall for a five year period has been used in the simulation.

The predicted leachate flows are shown in Figure 5.3.

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The simulation estimates that the average leachate flow from Stage 1/1A following closure will be approximately 432 cubic metres per day (compared to the current simulated average of 504 cubic meters per day) and that the peak flow is likely to be in the order of 1875 cubic metres per day (compared with the current simulated peak of 2163 cubic metres per day).

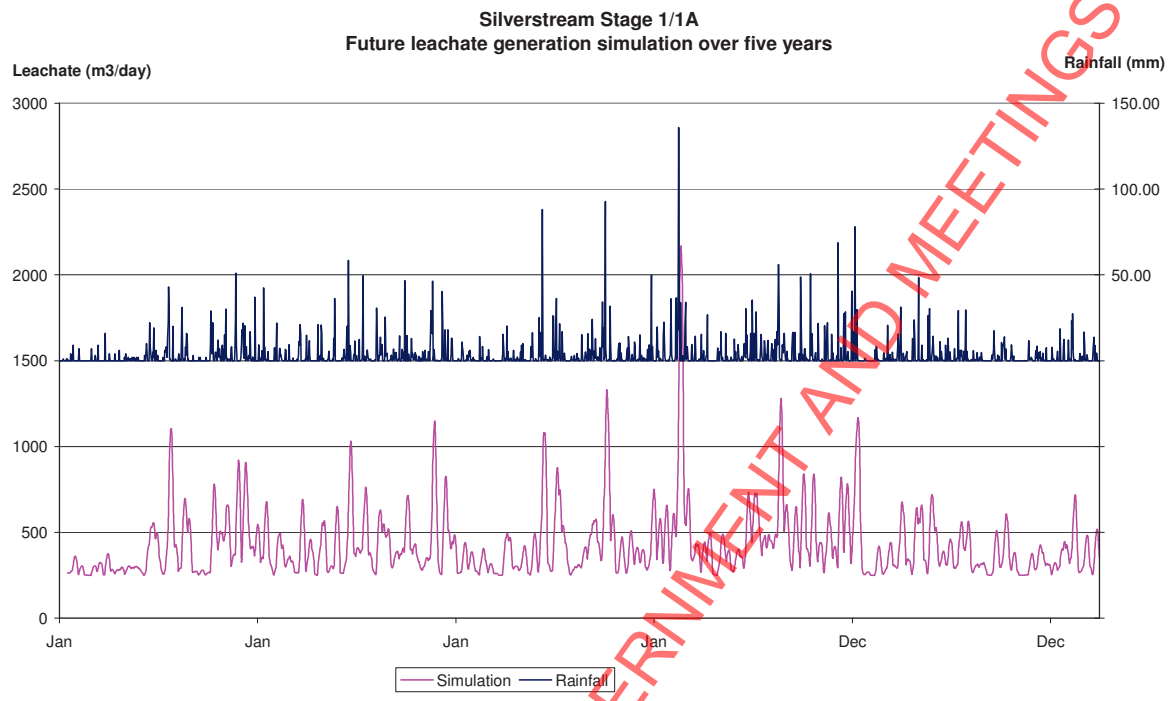

Figure 5.3 Leachate simulation post closure of Stage 1/1A

5.2.4 Design flow rate for the Stage 1/1A leachate bypass

Flowing closure of the Stage 1/1A landfill, leachate is to be intercepted above and below the Stage 2 liner system. Based on the above analysis the interception system should be designed for an average flow of 450 cubic metres per day and a peak of 2500 cubic metres per day.

The analysis is based on off site rainfall data from 1 January 2001 to 31 March 2006. During this period the maximum rainfall in any one day is 135.7 millimetres. The maximum rainfall recorded at the site between 14 September 1997 and 31 March 2006 is 117 millimetres.

Weather extremes for Lower Hutt between July 1984 and December 2004 on the internet (http://homepages.paradise.net.nz/tmcgavin/lh_stats.html) give the wettest 24 hour rainfall on 15 February 2004 which is the same date as the extreme from the Silverstream off site data. The MetService states that the maximum rainfall in 24 hours anywhere in New Zealand since 1937 is 462 millimetres in Hokitiki in January 1994 (http://www.metservice.co.nz/default/index.php?pkey=190512&ckey=191582). It is therefore reasonable to assume that the simulation has taken into account a reasonably extreme rainfall event.

Nonetheless, a peaking factor of 1.5 is applied to the peak from the simulation to determine a maximum design value. Therefore the pipe from Stage 1/1A has been designed for a maximum flow of 45 l/s. It is difficult to accurately assess the distribution

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of the intercepted flow between the low and high level bypass pipes. Therefore, both pipes have been conservatively designed to carry the total design flow (ie 45 l/s).

5.3 Lower Stage 1/1A leachate bypass pipeline design

5.3.1 Flow capacity

Design calculations for the lower Stage 1/1A leachate bypass pipe are included in Appendix A (Calculation 01). In the extremely unlikely event that the lower leachate bypass pipe and the groundwater drainage pipe rupture as a result of a seismic event, the gravel surround and rockfill could potentially be required to carry the combined leachate and groundwater flow. The calculations included in Appendix A (Calculation 01) demonstrate that the 250 millimetre diameter lower leachate bypass pipe has significantly greater capacity (131 litres per second) than the design flow of 45 litres per second. The calculations also demonstrate that the gravel surround and rockfill have sufficient hydraulic capacity to convey the combined groundwater and leachate flow.

5.3.2 Pipe strength

The strength of the lower bypass pipe has been selected based on wall crushing and buckling criteria. The calculations (Appendix A, Calculation 03) demonstrate that a PE 100 SDR 11 pipe has acceptable factor of safety against crushing and buckling with and without taking into account incomplete projection. These calculations are based on a 50 year design life and the design approach proposed by Driscopipe in their pipeline design manual.

5.3.3 Connection to existing pipework

An interception sump has been constructed as part of the Enabling Works to intercept the low level leachate and groundwater drains. Details of the interception sump are provided on Drawings 83091.300-LCS403 and LCS404.

5.4 Upper Stage 1/1A leachate bypass pipeline design

5.4.1 Flow capacity

Design calculations for the upper Stage 1/1A leachate bypass pipe are included in Appendix C (Calculation 01). The calculations demonstrate that the 250 millimetre diameter upper bypass has sufficient capacity (168 litres per second) to convey the design flow of 45 litres per second.

5.4.2 Pipe strength

The strength of the upper bypass pipe has been selected based on wall crushing and buckling criteria. The calculations (Appendix C, Calculation 02 and 03) demonstrate that a PE 100 SDR 11 pipe has acceptable factor of safety against crushing and buckling with and without taking into account incomplete projection. These calculations are based on a 50 year design life and the design approach proposed by Driscopipe in their pipeline design manual.

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5.4.3 Connection to existing pipework

The connection to the existing pipework will be made as part of the Phase 1 Slope 3 works and the design of this connection will be included in the relevant design document. In the meantime the end of the upper Stage 1/1A will be blanked off and protected as shown in Drawing Number 83091.400-LCS302 and LCS303.

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6 Liner system

6.1 Overview

In order to optimise the void space available for waste placement, the formation slopes have been designed as steep as possible whilst still maintaining an adequate factor of safety for formation and liner design.

6.2 Liner types

6.2.1 General

The complex nature of the geometry of the formation has necessitated the specification of four liner types, namely:

- Type A – base.
- Type B – slopes shallower than 1 vertical on 2 horizontal.
- Type C – slopes between 1 vertical on 2 horizontal and 1 vertical on 1 horizontal.
- Type D – slopes steeper than 1 vertical on 1 horizontal.

Details of the liner systems are shown on Drawing Number 83091.400-LNR202.

The liner systems all meet their primary objectives, namely to provide environmental containment of the landfill, and physical separation from the external environment. The liner types are based on those proposed as part of the consenting process for the Stage 2 development. Specific details however, have been refined as part of the detailed design process. The liner types represent best engineering practice in New Zealand and overseas, based on the philosophy of Subtitle D landfills.

6.2.2 Type A – Base

The base liner is based on an USEPA Subtitle D liner incorporating (from waste down):

- 500 millimetre thick leachate drainage layer.
- 1000 grams per square metre non-woven polyethylene protection geotextile.
- 1.5 millimetre thick high density polyethylene (HDPE) geomembrane with textured upper and lower surface.
- 600 millimetre thick compacted soil liner with a maximum hydraulic permeability of 1 x 10^{-9} metres per second.

6.2.3 Type B – Slopes shallower than 1 vertical on 2 horizontal

The shallower slope liner is based on a USEPA Subtitle D liner system and is similar to liners installed in a number of landfills in New Zealand. The liner system proposed for soil fill slopes incorporates (from waste down):

- 300 millimetre thick leachate drainage layer.
- 10 kilo Newtons per metre reinforcement grid.
- 1000 grams per square metre non woven polyethylene protection geotextile.
- 1.5 millimetre thick HDPE geomembrane with smooth upper surface and textured lower surface.

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- 600 millimetre thick compacted soil liner with a maximum hydraulic permeability of 1 x 10^{-7} metres per second.

A similar liner system is to be placed on top of the prepared surface of the front face of the Stage 1/1A waste mass. To accommodate ongoing settlement of the Stage 1/1A waste mass, the compacted soil component of the overlay liner has been thickened from 600 millimetres to 1200 millimetres.

6.2.4 Type C – Slopes between 1 vertical on 2 horizontal and 1 vertical on 1 horizontal

Transition slopes between the shallow soil fill slopes and the steep rock slopes are too steep for the satisfactory placement of a compacted soil liner beneath the HDPE geomembrane. Therefore, a Geosynthetic Clay Liner (GCL) is to be provided. The Type C liner system therefore comprises of (from waste down):

- 300 millimetre thick leachate drainage layer.
- 10 kilo Newtons per metre reinforcement grid.
- 1000 grams per square metre non woven polyethylene protection geotextile.
- 1.5 millimetre thick HDPE geomembrane with smooth upper surface and textured lower surface.
- 6 millimetre thick GCL with non woven geotextile top and bottom surface with a maximum hydraulic permeability of 1 x 10^{-9} metres per second.

6.2.5 Type D – Slopes steeper than 1 vertical on 1 horizontal

The cut rock slopes are too steep for the satisfactory installation of a GCL. Therefore, an innovative approach to the liner system has been adopted based on over ten years experience of lining similar slopes in Hong Kong. The steep slope liner consists of (from waste down):

- 300 millimetre thick leachate drainage layer.
- 10 kilo Newtons per metre reinforcement grid.
- 1000 grams per square metre non woven polyethylene protection geotextile.
- 1.5 millimetre thick HDPE geomembrane with smooth upper surface and textured lower surface.
- 1000 grams per square metre non woven polyethylene protection geotextile.
- 150 millimetres thick no fines concrete layer.

The proposed rock liner system provides is robust and suitable for a wide range of surface rock quality and finishes.

6.3 Liner leakage assessment

Darcy's equation can be used to estimate the seepage rate through a CCL once the liner has become fully saturated. For a composite liner which includes an HDPE geomembrane, the design seepage rate can be estimated based on known field data related to liner defect frequency for geomembranes and assumed soil permeabilities using the method of Giroud et al (1998).

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Defects can occur in the HDPE geomembrane as a result of manufacture and installation. Modern manufacturing techniques have dramatically reduced the potential for manufacturing defects and when combined with vigorous quality control practices during installation the risk of significant defects has been virtually eliminated. Notwithstanding this, pinhole defects can still avoid detection and therefore a leakage assessment is necessary to ascertain the potential impact on the surrounding environment.

Leakage assessment calculations for the four liner types are provided in Appendix D (Calculation 01a and 01b). In line with generally accepted practice, the leachate head has been taken as 300 millimetres above the liner. The impact of both poor and good contact between the HDPE geomembrane and the soil liner has been assessed for a defect area in the HDPE geomembrane of 0.1 millimetres and a defect frequency of 2.5 per hectare. These assumptions are consistent with the recommendations in Giroud et al (1998) for intensively monitored installation. There is a significant level of expertise in New Zealand in the installation and supervision of HDPE geomembrane and therefore these assumptions are considered valid.

The results of the assessment are summarised in Table 6.1.

Table 6.1: Liner leakage assessment results

	Liner Leakage (m^3/ha/yr)	
Liner Type[1]	**Good contact**	**Poor contact**
A	0.51	2.78
B	15.33	83.95
C	0.09	0.51

Notes 1 Liner type D is installed on steep slopes (< 1:1) with leachate collection system above, therefore no driving head will be established and liner leakage calculations are not necessary.

The values listed in Table 6.1 are considered to be at the upper end of likely leakage rates. A high permeability drainage layer is to be provided for all liner types and therefore there is very little potential for the assumed leachate head of 300 millimetres to develop. Furthermore the calculations do not take into account the slope angle which will reduce further the driving head through the HDPE geomembrane.

6.4 Liner design

6.4.1 General

In a liner system consisting of a number of synthetic and natural materials, each has a specific function and each has different interface strength properties. Given the heterogeneity of waste and the multiplicity of interfaces within the liner system, an accurate prediction of the behaviour of a liner system and its interface with the waste is difficult and results in the need for careful and conservative design. Consequently, the design of geocomposite liner systems should include specific engineering features that cater for uncertainties in the behaviour of the system, whilst protecting the integrity of the primary membrane, the HDPE.

There are three primary elements to the assessment of the stability of a liner system: the anchor trench detail, stability during the construction of the liner system and stability of

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the system when waste has been placed against it. Each of these is considered in subsequent sections.

The design of the liner system's components has therefore addressed:

- The required puncture resistance of the protection geotextile.
- The required geometry of the anchor trench.
- The potential stress in the liner components during installation, placement of waste and as a result of ongoing waste consolidation and settlement.

6.4.2 Design parameters

The measured characteristics of the materials and their interfaces provide an indication of the possible ranges of behaviour in different circumstances. The values adopted for analysis should reflect the behaviour under particular circumstances. However, the values adopted for design should reflect those that represent a lower bound of possible strength behaviour and are not necessarily those that are used for analysis of observed behaviour.

The main parameters used in the liner design are summarised in Table 6.2.

Table 6.2: Liner design parameters

Description	Value
Design slope height	Height = 6 m
Minimum design bench width	Bench = 4 m
Maximum depth of waste	d = 80 m
Geomembrane thickness	t = 1.5 mm
Unit weight of waste	$\gamma = 14$ kN/m^3
Unit weight of leachate drainage material	$\gamma = 20$ kN/m^3
Unit weight of backfill	$\gamma = 19$ kN/m^3
Ultimate geomembrane stress	$T_{ult} = 22.5$ kN/m
Ultimate strength of geogrid	$T_{ult} = 10$ kN/m
Interface friction angle between:	
▪ geotextile and smooth HDPE	$\delta = 10°$
▪ textured HDPE and soil	$\delta = 26°$
▪ textured HDPE and GCL – dry	$\delta = 30°$
▪ textured HDPE and GCL – wet	$\delta = 8°$
Roughness coefficient (slimed HDPE pipe)	$k_s = 0.3$ mm

The interface friction angle parameters presented in Table 6.2 have been inferred from typical values for similar liner materials elsewhere. These values will be confirmed prior to installation of the liner system by undertaking site specific interface friction angle testing. The results of this analysis will be provided in a separate document.

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6.4.3 Protection geotextile selection

Puncture resistance calculations for the protection geotextile are provided in Appendix D (Calculation 02). These calculations indicate that for the maximum waste depth of 80 metres the required protection geotextile weight varies from 135 grams per square metre to 615 grams per square metre depending on the assumed angularity of the drainage material. Therefore a 1000 gram per square metre protection geotextile has been selected to provide the maximum flexibility in the selection of the granular drainage material and provide robust protection to the HDPE geomembrane.

6.4.4 Anchor trench design

The purpose of the anchor trench is to provide temporary support for the geosynthetic liner system during construction and initial waste placement. In the permanent condition, in common with any liner system, the liner must accommodate the strains associated with waste settlement (discussed below).

The anchor trench must be designed to be static until the stress in the geomembrane reaches a defined proportion of the yield stress of the HDPE. At stresses above this point, the trench is designed so the geomembrane pulls out from the anchor trench to relieve the stress and to prevent the HDPE from rupturing. Should this condition be reached, the movement of the HDPE commences. Nonetheless, the environmental integrity of the liner system is typically not compromised until the full length of the overlap (typically the full bench width) has been dragged out of the anchor trench and parted from the liner system on the slope above .

The anchor trench is designed to provide sufficient resistance to a pull out force equivalent to 67% of the ultimate strength of the HDPE geomembrane (ie 15 kN/m). In other words, the anchor trench is designed to pull out before the ultimate strength of the HDPE geomembrane is reached and hence avoiding rupture of the HDPE geomembrane.

Typical details of the anchor trenches provided at the top of Slope 1 and Slope 2 are shown on Drawing Numbers 83091.400-LNR203 and 83091.400-LNR204 respectively. Design calculations are included in Appendix D (Calculation 03).

6.4.5 Liner system behaviour on loading

The vertical stresses in the waste mass are considerably greater than the ultimate tensile strength of the 1.5 mm thick HDPE geomembrane (22.5 kN/m). Therefore, such a liner system employing an HDPE geomembrane must prevent the vertical stresses in the waste mass from being translated into tension within the HDPE geomembrane. The design of the side slope liner system incorporates a defined plane above the HDPE geomembrane, which will allow internal settlement within the adjacent waste mass whilst reducing the stresses transmitted across the HDPE geomembrane. This is achieved by installing a geomembrane with the upper smooth surface and the lower surface textured. The interface between the upper smooth surface and the protection geotextile will act as the defined slip plane.

6.4.6 Stresses in the liner system

The stresses developed in the HDPE geomembrane are dependent upon not only the geometry but also on the strength characteristics of the interfaces.

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Interface friction angles between geosynthetics change depending upon stress and hydration conditions. However, those for a geotextile and HDPE geomembrane do not vary significantly under different conditions.

The tension developed within the HDPE can be assessed by adapting conventional limit equilibrium methods developed by Koerner (1997) and supplemented by the methods introduced by Kodikara (1996). These enhanced methods can be used to determine the conditions for stability and the conditions determining the onset of movement at a particular interface. They are also used to determine the stresses, within particular liner materials, prior to the onset of movement at an interface. The method also presumes a specific sequence in which the various forces are mobilised:

- Frictional forces at a liner interface, because the peak friction angles are reached at small strains; followed by
- The passive resistance associated with the wedges of leachate collection stone at the toe; and then
- The resistance of the anchor trench and tension in the reinforcement geogrid. If the active and passive wedges of the leachate collection stone are stable, then no tensile stress within the anchor trench will develop.

6.4.7 Introduction of a defined slip surface within the side slope liner system

The design of the side slope liner system is configured to introduce a defined plane above the HDPE geomembrane, which will allow internal strain to develop within the adjacent waste mass and reduce the stresses transmitted across the HDPE geomembrane. This is achieved by installing a geomembrane with the upper surface smooth and the lower surface textured. The interface between the upper smooth surface and the protection geotextile will act as the defined slip plane.

This intended behaviour has been studied in full scale tests by Gourc et al (1997) for a similar liner system. The liner system consisted of waste over a gravel leachate collection layer, cushion geotextile, geomembrane and a clay barrier over a 1 vertical on 2 horizontal formation slope. The movement of the geotextile and geomembrane were measured during the placement of the leachate collection layer and as the waste filling proceeded. During the construction of the leachate collection layer the cushion geotextile moved down the slope as much as 70 millimetres whilst the geomembrane moved less than 5 millimetres. Further movement in the cushion geotextile was experienced during the waste placement against the liner system.

Similar tests have been conducted by Kanou et al (1997) on a 1 vertical on 1.5 horizontal formation slope. The HDPE geomembrane was placed both with and without a cushion geotextile above it and the stress in the HDPE geomembrane was measured as the waste was placed against the liner system. Considerably less stress due to down drag of the waste was developed in the geomembrane when the HDPE was protected by the geotextile (approximately 1.5 kN/m for a 3 metre waste lift). However, the experiments also demonstrated that stress developed as a result of daily cycles in ambient temperature (change of about 30°C) and compaction plant, if close to the liner system. In both cases the stresses developed in the HDPE geomembrane were lower (6.7 kN/m combined) where a geotextile protected the HDPE geomembrane.

The calculations provided in Appendix D (Calculation 04a to 04d) demonstrate that without the defined slip surface the maximum waste placement depth against the three

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slope liner types is between 50 metres to 65 metres depending on slope angle. The maximum waste placement depth is 80 metres and therefore the defined slip surface is required.

A side slope liner system with a protection geotextile above a smooth/textured HDPE geomembrane will accentuate the beneficial effects of the protection geotextile noted by both Gourc et al (1997) and Kanou et al (1997), whilst minimising the effects of thermal stresses and compactive effort noted by Kanou et al (1997).

Experience of similar liner systems in Hong Kong has shown that the maximum allowable tension in the geotextile is typically quickly reached if a reinforcement geogrid is not provided as the leachate stone is placed.

The calculations in Appendix D (Calculation 05b, 05c and 05d) demonstrate that the reinforcement geogrid allows individual lifts of leachate stone in the order of 3 metres above the waste without inducing excessive stress in the geotextile. Thus, the liner system can be constructed by placing no more than 3 metres of leachate collection stone in advance of the waste placement.

6.4.8 Waste settlement

Given modern methods of waste placement and compaction, waste will typically undergo total settlement of approximately 25% of the waste depth. Of this, about half occurs during waste placement. After placement there will be ongoing secondary compression and settlement, the rate of which is at a maximum immediately following placement. Consequently, on completion of waste filling to the top of an individual slope there is expected to be around 12.5% long-term settlement that will ultimately occur below that level as a result of secondary compression and waste degradation.

The magnitude of the long term settlement at an individual point within the waste mass is related to the depths of waste above and below the specific location. The greater the depths of waste above and below an individual point within the waste mass, the greater the long term settlement at that individual point. In practice, this means that the waste settlement will be significantly greater in the waste mass directly above the base liner than adjacent to the side slope liner for the same top waste level. This is because, with each successive bench and slope, the depth of waste below reduces (Figure 6.1).

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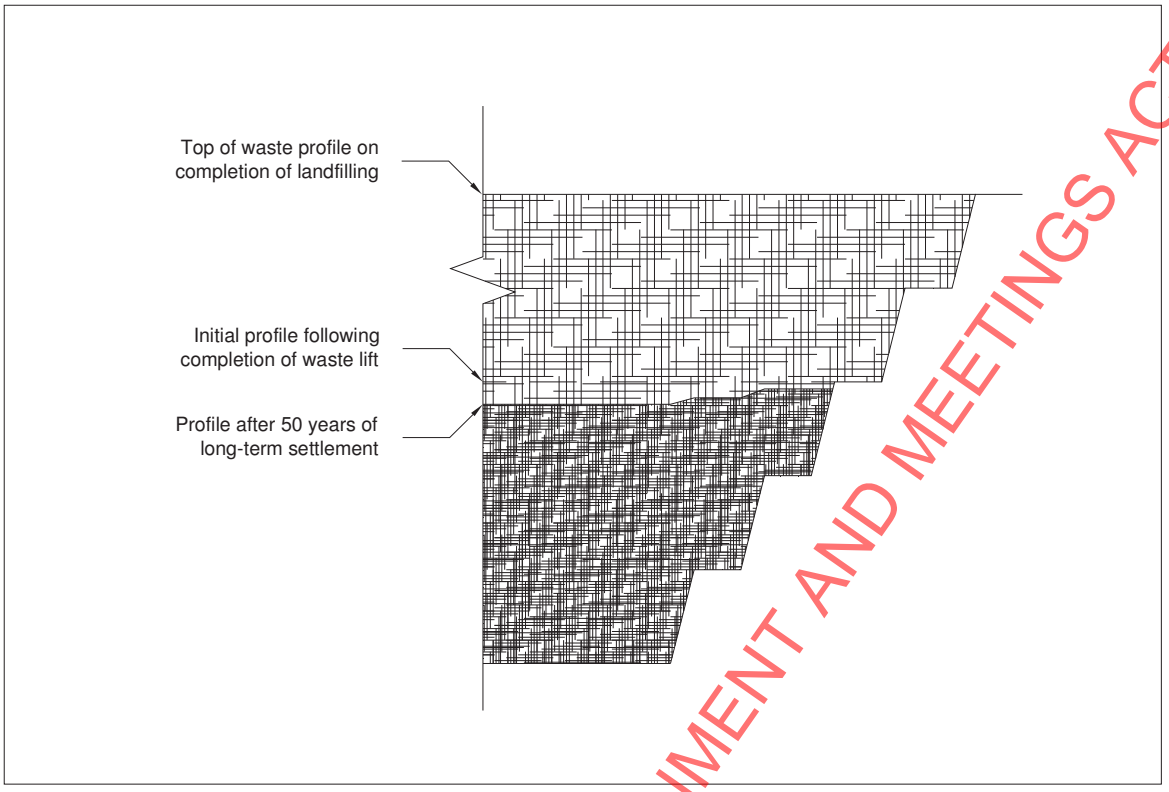

Figure 6.1 Long term waste settlement profile

The ongoing settlement results in additional down drag of the geogrid and protection geotextile, above the HDPE membrane, once waste has been placed above the particular slope.

The long-term waste settlement profile in Figure 6.1 demonstrates that the liner system only needs to accommodate the long-term settlement of the waste block immediately above a bench. The four metre wide benches to be provided at Silverstream will serve to isolate the waste immediately adjacent to the liner system from preceding waste lifts. As the slope heights are constant, the long-term settlement is at a maximum at the top of the first slope as this is where the overburden pressure is at a maximum. For a six metre slope height the maximum long-term settlement is estimated to be in the order of 1.1 metres (Appendix D, calculation 06).

The predicted long-term settlement is accommodated by the provision of additional geogrid and protection geotextile which are located at the crest of the slope until it is progressively dragged down as the waste settles, as shown in Drawing Number 83091.400-LNR205.

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6.4.9 Placement of leachate drainage layer against the steep side liner systems

The side liner systems steeper than 1 vertical on 1 horizontal are steeper than the natural angle of repose of the granular leachate drainage layer. A common and successful means of placing the leachate drainage layer is in a Christmas Tree pattern in advance of waste placement as shown on Drawing Number 83091.400-LNR206. The leachate stone is placed against the liner at its angle of repose, so that it decreases to the minimum required thickness at the top of an individual lift (ie 3 metres as stipulated above). The next lift of waste is then placed against it and the resulting waste surface us used as the platform for the construction of the next lift of the leachate drainage material. In this manner a Christmas Tree pattern is formed.

The optimum height of each lift is determined by the balance of operational flexibility and the cost of the additional leachate stone to form a stable slope. Although 3 metres is a maximum theoretical height for placement – the height adopted is often less than this.

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7 Phase 1 and 2 leachate management system

7.1 Introduction

The leachate management system to be constructed as part of the Phase 1 Base, Slope 1 and Slope 2 works includes:

- A granular drainage layer and perforated pipe in the base;
- Granular drainage layer placed against the liner system on the side slopes;
- A discharge pipe through the toe bund for Phase 1 leachate;
- A manhole downstream of the Phase 1 toe bund;
- Gravity discharge from the manhole to the existing leachate discharge pipe.

The leachate collection system layout is shown on Drawing Number 83091.400-LCS302. Details are shown on Drawing Numbers 83091.400-LNR205 to LNR206 and LCS303. Design calculations are included in Appendices E & F.

The Phase 1 and 2 leachate management system will be connected as appropriate to the existing Stage 1 system shown on Drawing Number 83091.400-LCS301.

The interface with the leachate collection system and the toe bund is discussed in Section 8.

7.2 Phase 1 and 2 leachate generation

7.2.1 Introduction

A similar approach has been taken to the estimation of leachate generation for Phase 1 and 2 as that adopted for Stage 1/1A. The off site rainfall data for the period from 1 January 2001 to 31 May 2006 has been used in the assessment. Details of this data are discussed in Section 5.

Rainfall infiltration onto the surface area of the combined Phase 1 and 2 waste mass has been considered in the simulation as the leachate collection systems for Phase 1 and 2 are not kept separate.

The results of this simulation are provided in Appendix E.

7.2.2 Waste filling scenarios

The current waste acceptance rate at Silverstream Landfill is approximately 115,000 tonnes per annum.

The leachate simulation in Appendix E has assessed the likely leachate generation associated with three waste filling rate scenarios, namely:

- Base case 140,000 tonnes per annum.
- Lower bound 126,000 tonnes per annum.
- Upper bound 154,000 tonnes per annum.

The Base Case takes into account the likely impact of the closure of Wainuiomata Landfill in 2011 (ie an additional 25,000 tonnes per annum above the current waste acceptance

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rate). The lower and upper bound scenarios represent 90% and 110% of the base case filling rate respectively.

7.2.3 Base flow

The amount of free water held within the delivered waste can have a significant impact on leachate generation and directly contributes to the leachate base flow. The proportion of the free water in the waste depends on the type of waste and the weather conditions at the landfill and waste catchment area. For temperate climates the base flow is typically 0% to 2.5% by weight of the incoming waste.

The leachate simulation has adopted a based flow of 2.5% by weight of the incoming waste. This is considered to be at the upper end of the base flow likely to be generated at Silverstream (Appendix E, Calculations 02a, 02b, 02c). Notwithstanding this conservative approach the impact of an elevated base flow (5% by weight) has also been assessed (Appendix E, Calculations 02d & 03b).

7.2.4 Simulation of leachate flows

The simulation assumes that the active filling area is in the order of 1 hectare and that approximately 5 hectares has a short term interim soil cover with a infiltration factor of 28 percent and 16.2 hectares has a long term soil cover with an infiltration factor of 1 percent. There is no groundwater catchment as the Stage 2 landfill is fully lined. It is assumed that appropriate operational procedures will be in place to divert surface water away from the waste mass and thereby minimising surface water infiltration.

Leachate has been simulated based on daily and monthly rainfall records to establish likely average and peak leachate flows throughout the operational life of the landfill.

The simulations are included in Appendix E and the results summarised in Tables 7.1 & 7.2.

Table 7.1 Phase 1 and 2 daily leachate simulation results

Calculation number	Case	Waste acceptance rate (tonnes per annum)	Base flow[1]	Predicted leachate flows (m^3/day)	
				Peak	Average
02a	Base case	140,000	2.5%	2795	139
02b	Lower bound	126,000	2.5%	2794	138
02c	Upper bound	154,000	2.5%	2796	140
02d	Base case	140,000	5.0%	2805	149

Notes 1 Percentage by weight of waste acceptance rate

From Table 7.1 it can be seen that the waste acceptance rate has marginal impact on the peak and average leachate generation rates. The base flow value has a disproportionate impact on the average leachate generation rate. A 2.5 percent increase in base flow results in a 7 percent increase in the average leachate generation. However, the increased base flow has a negligible impact (less than 0.5 percent) on the predicted peak flow.

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Table 7.2 Phase 1 and 2 monthly leachate simulation results

Calculation number	Waste acceptance rate (tonnes per annum)	Base flow[1]	Average leachate flows (m³/day)		
			Average rainfall (1185 mm)	Extreme year[2] (2240 mm)	Maximum recorded[3] (1793 mm)
03a	140,000	2.5%	140	256	207
03b	140,000	5.0%	150	266	217

Notes 1 Percentage by weight of waste acceptance rate
2 Artificially created by taken extremes for all months
3 2004 data

Table 7.2 demonstrates that even with extreme rainfall data, the average is an order of magnitude less than the predicted peak flow.

7.2.5 Design flow rates for Phase 1 and 2 leachate management system

The average leachate generation rate is an order of magnitude less than the predicted peak. Furthermore the simulated peak (2800 cubic metres per day) appears to be the direct result of an extreme rainfall event and is significantly greater than other predicted peaks form the simulation (typically in the order of 1000 cubic metres per day to 1500 cubic metres per day.

There is not existing leachate flow data and therefore it is not possible to calibrate the simulation.

A conservative approach has been adopted in the design of the leachate collection layer in the base of Phase 1 to ensure that the leachate head above the liner is maintained at less than 300 mm even in an extreme event. Therefore the design flow is conservatively taken as 2800 cubic metres per day.

7.2.6 Seismic considerations

As with the Stage 1/1A bypass pipes, consideration has been given in the design of the Stage 2 leachate collection pipes to the potential for rupture of the pipework during a seismic event. While this risk is low, mitigation measures have been introduced in the design by surrounding the leachate pipe in gravel of sufficient hydraulic capacity to convey the leachate flow.

The hydraulic flow capacity of the gravel drainage layer is sufficient to convey both the Stage 1 and Stage 2 leachate design flows in the unlikely event that both pipes rupture. This is discussed in more detail below.

7.3 Basal leachate collection system design

7.3.1 Flow capacity

The Phase 1 basal leachate collection system comprises:

- 200 mm diameter SDR11 PE 100 perforated leachate spine drain.

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- 500 millimetres thick 20/10 granular drainage layer.

The calculations included in Appendix F (Calculation 01) demonstrate that the perforated pipe has greater capacity (48 litres per second) than the design flow of 32 litres per second.

Notwithstanding this significant redundancy in the design and in particular , in the unlikely event that the groundwater pipe ruptures in a seismic event, the hydraulic capacity of the gravel surround and rockfill is sufficient to convey the entire design flow (combined Phase 1 & 2 leachate and Stage 1/1A leachate flow of 62 litres per second). Therefore, the proposed groundwater collection system is a robust system with significantly greater capacity than the design condition.

7.3.2 Pipe perforation size

The pipe bedding / drainage gravel for the primary leachate drains is 20/10 gravel. The pipe perforations must be compatible with the grading of the surrounding drainage aggregate and allow free flow into the pipe.

The design calculations in Appendix F demonstrate that 9 millimetre diameter perforations at 125 mm spacing meet the hydraulic and filter compatibility requirements.

7.3.3 Pipe strength

The strength of the leachate pipe has been selected based on wall crushing and buckling criteria. The calculations (Appendix F, Calculations 03 & 04) demonstrate that a PE 100 SDR 11 pipe has acceptable factor of safety against crushing and buckling with and without taking into account incomplete projection. These calculations are based on a 50 year design life and the design approach proposed by Driscopipe in their pipeline design manual.

7.4 Side slope leachate collection system

A 300 millimetre thick leachate collection layer is provided on the side slopes on all liner types. The placement of the drainage material must be undertaken in lifts of no greater than 3 metres to ensure the liner system is not overstressed. This is discussed in more detail in Section 6.

7.5 Leachate discharge system

The leachate will discharge by gravity through the toe bund and be connected to the existing leachate discharge pipe. This is discussed in more details in the Section 8.

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8 Interim toe bund

8.1 Overview

8.1.1 Purpose

The toe bund to be constructed at the northern end of Phase 1 has two key purposes:

1. To close the Phase 1 containment system and form an effective cut-off for leachate and landfill gas
2. To form a berm that will enable the temporary front face and hence the overall volume of Phases 1 - 2 to be optimised.

8.1.2 Performance requirements

The toe bund, which will need to remain in place until the end of Phase 2 (approximately 15 years) has a number of key performance requirements:

- It must be stable
- It needs to have a crest level at a minimum of approximately RL 87 m to optimise front face geometry (and hence airspace within Phases 1 and 2)
- It requires careful detailing of penetrations for the leachate pipework from Phase 1 and the old Stage 1 landfill
- Construction needs to avoid interference with groundwater drains constructed as part of the enabling works
- The detailing needs to ensure that the later removal of the bund in preparation for the Phase 3 development can be achieved relatively simply without de-stabilising the landfill front face.

8.2 Bund concept

8.2.1 General

The bund is a temporary, albeit long term, closure for Phases 1 and 2. Its primary purpose is to provide a cut off at the northern (lowermost) end of the Phase 1 liner to ensure leachate and landfill gas remain contained.

The bund is in three parts:

- An upper gravel bund with internal drainage to provide effective leachate head control in the bund and cutoff area
- A gravity outlet to the Phase 1 leachate drainage pipe and the internal solid pipe that will ultimately comprise the Stage 1/1A high level leachate outlet together with a cutoff to control leachate seepage.
- A downstream earth bund component that encloses the gravel drainage component and controls LFG migration.

When Phase 3 is formed, the downstream (earth) part of the bund inclusive of the separation geotextile will be removed and covered temporarily (for LFG control) until Phase 3 filling occurs against the gravel bund that remains.

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8.2.2 Cutoffs

The primary liner underlies the whole of the toe bund; therefore there is no compromise of the integrity of the landfill's primary containment. Thus even in the event of unanticipated leakage from the cutoff system, leachate will remain contained and may be intercepted and collected.

The primary leachate containment feature is the HDPE cutoff system. The primary cutoff is an HDPE flap running across the Phase 1 cell at RL 84.5 m that is intended to seal the liner at the downstream end of Phase 1. An HDPE flap is carried up the internal (upstream) face of the earth fill component of the bund, and prefabricated HDPE boots are welded into the flap and extrusion welded to the penetrating HDPE pipes at both ends. To minimise the risk of any seepage at the primary cutoff boots tracking along the pipes, both pipe penetrations are wrapped with a "GCL bandage" outside the boot welds and extending along the pipe barrels.

The second control on leachate leakage will be the provision of effective drainage in the bund core. Below RL 84.25 m on the upstream side of the HDPE cutoff, full drainage is provided and two supplementary perforated collector pipes at the upstream toe of the primary cutoff. These, combined with the gravity outlet of the 200 mm primary leachate pipe, will ensure that leachate head in this area remains minimal.

8.2.3 Internal drainage

As part of the Phase 1 leachate drainage outlet, a prefabricated cross-connector is included near the toe with either prefabricated or locally curved collectors of a lighter pipe grade to be laid perpendicular to the main drain to ensure head build-up cannot occur near the primary cutoff flap (see 83091.400-TOE407).

The Stage 1/1A high level outlet pipe (which is required at Phase 2) is raised upstream of the cutoff to provide uniform fall while passing above and to the east of the Phase 1 leachate line and through the cutoff in a separate higher-level boot. This pipe is capped at the downstream (and upstream) ends in the interim.

At the downstream toe a leachate manhole is provided to facilitate gravity drainage, as well as recirculation options (by way of a separate line) and flushing access for the leachate line.

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9 Global stability analysis

9.1 Introduction

Landfill stability, particularly under earthquake, was examined in detail as part of the Resource Consent process. The results of this analysis are presented in Appendix B: Preliminary Engineering Report.

The Phase 1 stability has been reassessed in relation to the stability of the Phase 1 and Phase 2 developments prior to placement of waste in the Phase 3 and 4 areas to take into account the minor revisions to the landfill liner system. The results of this assessment are included in Appendix G.

The minimum Factor of Safety under design static conditions has been taken as 1.5.

9.2 Material properties

Adopted design criteria and strength parameters are summarised in Table 9.1. Key material parameters include the waste; liner components interface strengths and foundation fill strengths.

Table 9.1 Stability analysis input parameters

Material	Design Element	Assessed Density (t/m³)	Shear Strength (Peak)	
			Cohesion (kPa)	Friction Angle (deg)
Existing waste	Old Landfill waste - composition and construction history uncertain	1.3	10	30
Engineered waste	Landfill waste - allowing for long-term consolidation of unsaturated waste with daily cover to refuse ratio of 1:4.5	1.4	25	35
Primary liner (HDPE)	Smooth HDPE - non woven geotextile Interface	-	0	10
	Textured HDPE - soil Interface	-	0	26
Sub Liner (Compacted Soil)	0.6m layer of EW-CW Greywacke	1.9	10	30
Foundation Fill (Rock fill)	SW-HW Greywacke	1.9	5	35
Foundation Geology	MW-HW Greywacke Rockmass	2.2	50	35
	UW-MW Greywacke Rockmass	2.2	75	40

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9.3 Groundwater

Three leachate/groundwater profiles (P1 to P3) have been assumed for slope stability analyses for both the Stage 1 and Stage 2 landfills, and for the underlying geology (Table 9.2).

Table 9.2 Groundwater assumptions

Design Case		Proposed Landfill (Piezometer line P1)	Existing Landfill (Piezometer Line P2)	Foundation Geology (Piezometer Line P3)
Case A	Design Leachate / Groundwater	Leachate levels maintained by drainage system above liner. On average levels will be maintained at about 0.3m above liner but have been modelled at 1.0 m to allow for locally less effective drainage.	Existing (measured) leachate levels in Landfill. Leachate levels maintained by groundwater recharge from foundation with no reduction in leachate levels expected once existing landfill capped.	Existing (measured) groundwater levels in foundation below existing Landfill grading to toe of existing landfill. Down valley (below new landfill) levels controlled by drainage provided by fill layer placed below liner system

9.4 Results of stability reassessment

The re-assessment of stability for Phase 1 and Phase 2 gives a calculated factor of safety of 2.00 for static conditions and design leachate levels. Prior to placement of waste in Phase 3 the toe bund will be partially removed (to maintain continuity in the leachate collection system across the base of the landfill) and the resulting factor of safety under static conditions is reduced to 1.99.

These analyses are considered conservative as:

- Three dimensional effects which would increase the assessed stability have not been allowed for
- The leachate heads assumed in the analyses are higher than would be expected given that the leachate drainage system is design to limit leachate head to less than 300mm over the liner system.

Analyses have also been carried out on the Phase 1 and 2 slopes to assess the stability under seismic conditions. This assessment indicates that during Phase 1 and the majority of Phase 2 the yield acceleration of the fill on the liner system across the floor and back slope is 0.22g. This approximately equates to the peak acceleration expected for a 50 year return period event for the site, (with a 10% probability of exceedance in 5 years). During the final filling of Phase 2 (RL 152m to 170m occurring in approximately 7 years) the yield acceleration progressively reduces to a minimum of 0.17g. This equates to a 20 year return period event (with a probability of exceedance of 20% in 5 years).

After completion of Phase 2, filling of Phase 3 will commence down slope of the toe and the stability of the temporary construction Phase 1 and 2 slopes will be improved.

On this basis, allowing for improved stability after the commencement of filling in Phase 3, the seismic risk associated with this temporary construction stage is considered acceptable.

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Appendix A: Groundwater drainage design calculations

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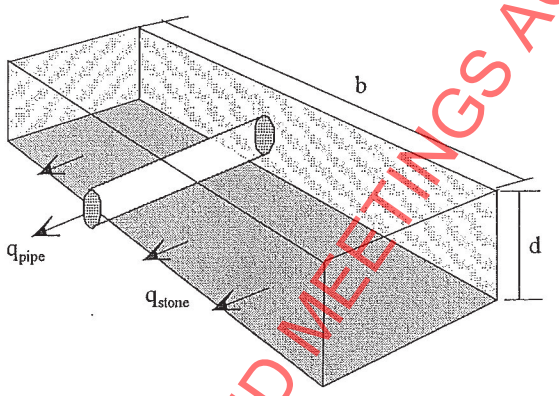
01 GROUNDWATER AND STAGE 1 LEACHATE DRAINAGE CAPACITY

The total flow capacity of the groundwater drainage layer is a combination of the flow in the granular media and the flow in the groundwater header pipes.



The groundwater pipe is designed to take the groundwater entering from the Stage 2 area, while the leachate pipe is for the piped flow of the low level Stage 1 leachate and groundwater flow beneath the Stage 2 liner. The drainage stone layer must have capacity for the Stage 2 groundwater, but also for the total leachate and groundwater flows in the case that the pipes shear.

The capacity of the granular drainage layer is estimated using Darcy's equation. Where the slope of the formation determines the hydraulic gradient of the flow.

The capacity of the groundwater drains is estimated using the Colebrook-White equation.

Units

$litre := 10^{-3} m^3$

Parameters

Groundwater and leachate headers

Adopt the longterm condition of the pipe, it is likely to become slimed over the years of service.

Roughness coefficient in mm (slimed perforated HDPE pipe) $k_s := 0.3mm$

Temperature of groundwater $t := 15 \ ^oC$

Design flows

Estimated existing groundwater flows — Downstream end of Phase 1

$Q_{GRD} := 2.10 \cdot litre \cdot s^{-1}$

$Q_{GRD} = 181 \, m^3 \cdot day^{-1}$

$FoS_{GRD} := 4$

Design groundwater flow $Q_{GRDDes} := Q_{GRD} \cdot FoS_{GRD}$

$Q_{GRDDes} = 8.4 \, litre \cdot s^{-1}$

Estimated leachate flow

$Q_{Leach} := 30 \cdot litre \cdot s^{-1}$

$Q_{Leach} = 2592 \, m^3 \, day^{-1}$

$FoS_{Leach} := 1.5$

Design leachate flow $Q_{LeachDes} := Q_{Leach} \cdot FoS_{Leach}$

$Q_{LeachDes} = 45 \, litre \cdot s^{-1}$

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Equations

Flow in the gravel drainage layer

Flow rate in m^3/day

$$q_{stone}(k,d,b,x) := k\cdot\frac{1}{x}\cdot d\cdot b$$

Flow rate in drainage pipes

Function for pipe full flow

$$q_{pipe}(x,D) := \left|\begin{array}{ll} & v \leftarrow \dfrac{40\cdot10^{-6}\cdot m^2\cdot s^{-1}}{20+t} \\ \text{Viscosity of water} & \\ & A \leftarrow \dfrac{\pi\cdot D^2}{4} \\ \text{Wetted Area} & \\ & P \leftarrow D\cdot\pi \\ \text{Wetted Perimeter} & \\ & R \leftarrow \dfrac{A}{P} \\ \text{Hydraulic radius} & \\ & v \leftarrow -\left(\sqrt{32\cdot g\cdot R\cdot\frac{1}{x}}\cdot\log\left(\dfrac{k_s}{14.8\cdot R}+\dfrac{1.255\cdot v}{R\cdot\sqrt{32\cdot g\cdot R\cdot\frac{1}{x}}}\right)\right) \\ \text{Colebrook-White equation} & \\ & A\cdot v \\ \text{Flow} & \end{array}\right.$$

Results

Pipe Capacities

Diameter of groundwater pipe		$Dia_{GRD} := 0.2m$
Diameter of leachate pipe		$Dia_{Leach} := 0.250\cdot m$
Slope (1:X)		$X := 33$
Capacity of gw pipe	$q_{pipeGRD} := q_{pipe}(X, Dia_{GRD})$	$q_{pipeGRD} = 73\,litre\cdot s^{-1}$
Capacity of leachate pipe	$q_{pipeLeach} := q_{pipe}(X, Dia_{Leach})$	$q_{pipeLeach} = 131\,litre\cdot s^{-1}$

$$Check1 := \left|\begin{array}{ll} \text{"Insufficient capacity in groundwater pipe"} & \text{if } q_{pipeGRD} < Q_{GRDDes} \\ \text{"Sufficient capacity in groundwater pipe"} & \text{otherwise} \end{array}\right.$$

Check1 = "Sufficient capacity in groundwater pipe"

$$Check2 := \left|\begin{array}{ll} \text{"Insufficient capacity in leachate pipe"} & \text{if } q_{pipeLeach} < Q_{LeachDes} \\ \text{"Sufficient capacity in leachate pipe"} & \text{otherwise} \end{array}\right.$$

Check2 = "Sufficient capacity in leachate pipe"

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300/20 Rockfill and 40/20 gravel (worst case: pipes sheared)

Permeability of drainage stone	Depth of drainage layer	Average breadth of drainage layer at critical point	Slope of drainage layer	
$k_1 := 10^{-1}\,m\cdot s^{-1}$	$D_1 := 0.5m$	$B_1 := 3m$	$X_1 := 33$	
$k_2 := 10^{-1}\,m\cdot s^{-1}$	$D_2 := 1.0m$	$B_2 := 20m - 3m$	$X_2 := 33$	(imported 300/20 rockfill drainage raft)
		$B_2 = 17\,m$		

Capacity of drainage stone $q_{stone1} := q_{stone}(k_1, D_1, B_1, X_1)$ $q_{stone1} = 4.5\,litre\cdot s^{-1}$

Capacity of drainage stone $q_{stone2} := q_{stone}(k_2, D_2, B_2, X_2)$ $q_{stone2} = 51.5\,litre\cdot s^{-1}$

Assessment of System Capacity

Total capacity of layer (pipes intact) $q_{total1} := q_{stone1} + q_{pipeGRD} + q_{pipeLeach}$

$q_{total1} = 208\,litre\cdot s^{-1}$

FOS with rockfill and 40/20 aggregate (both pipes sheared) $q_{totalstone} := q_{stone1} + q_{stone2}$

$q_{totalstone} = 56\,litre\cdot s^{-1}$

Check3 := "Insufficient capacity in rockfill & gravel" if $q_{totalstone} < Q_{GRDDes} + Q_{LeachDes}$

"Sufficient capacity in rockfill & gravel" otherwise

Check3 = "Sufficient capacity in rockfill & gravel"

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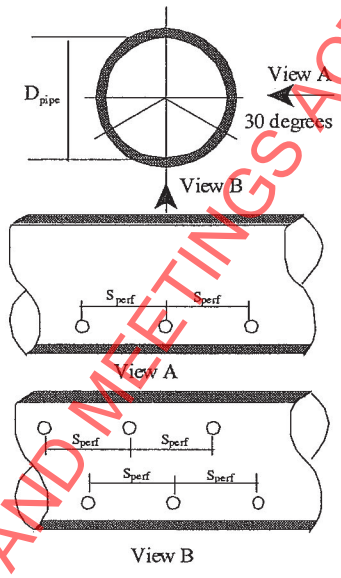
02 GROUNDWATER PIPE PERFORATION CAPACITY

The pipes are to collect the flow across a representative area.

The design constraint is that the flow level should not rise above the top of the collection layer.

The perforations are set at 1/3 of the depth of the collection layer above the base of the layer.



Parameters

Design flow (based on max daily flow)	$Q := 8.4L \cdot s^{-1}$	$Q = 726\,m^3 \cdot day^{-1}$
Depth of collection layer		$D_l := 0.5m$
Length of pipe		$L_l := 220m$
Perforations diameter		$d_{perf} := 13mm$
Perforation spacing		$s_{perf} := 125mm$
Number of rows of perforations		$row_{num} := 3$
Orifice coefficient for sharp edge orifice		$C_d := 0.63$

Calculations

Flow per metre length of pipe	$Q_{permetre} := \frac{Q}{L_l}$	$Q_{permetre} = 3.818 \times 10^{-5}\,m^3 \cdot s^{-1} \cdot m^{-1}$
Area of perforation	$a := \frac{1}{4} \cdot \pi \cdot d_{perf}^{2}$	$a = 132.7\,mm^2$
Flow through each perforation	$q_{perf} := C_d \cdot a \cdot \sqrt{2 \cdot g \cdot \frac{2 \cdot D_l}{3}}$	$q_{perf} = 2.138 \times 10^{-4}\,m^3 \cdot s^{-1}$
Number of perforations per metre length	$N_{perf} := \frac{1m\,row_{num}}{s_{perf}} \cdot m^{-1}$	$N_{perf} = 24\,m^{-1}$
Capacity of perforations per metre length	$Q_{perf} := q_{perf} \cdot N_{perf}$	$Q_{perf} = 5.131 \times 10^{-3}\,m^3 \cdot s^{-1} \cdot m^{-1}$
Total pipe capacity	$Q_{tot} := Q_{perf} \cdot L_l$	$Q_{tot} = 1.129\,s^{-1} \cdot m^3$
Check capacity of perforations	Check1 := "Perforation capacity sufficient" if $Q_{perf} > Q_{permetre}$ "Insufficient perforations" otherwise	

Check1 = "Perforation capacity sufficient"

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03 HORIZONTAL PIPE STRENGTH

Suitable for use in the design of horizontal pipes buried at depth without particular support to the pipe structure. Generally used for the design of horizontal drainage pipes in HDPE.

Design approach:

- Calculate the external pressure on the pipe, this includes long-term loading and short term loading.
- Factor the external pressure to account for the difference between the perforated pipe surface and a solid wall pipe.
- Determine the factor of safety for wall crushing.
- Determine the Modulus of Elasticity for pipe material at the anticipated design life of the pipe taking account of the effects of compressive stress and temperature.
- Determine the factor of safety for wall buckling.
- Determine the factor of safety for ring deflection.

Parameters

Unit weight of soil (waste & rockfill) $\gamma_s := 14.4kN \cdot m^{-3}$

Maximum depth of soil (waste & rockfill) $d := 85m$

Soil Modulus (of surrounding material - crushed rock) $E' := 100MPa$

Pipe SDR (standard dimension ratio) $SDR := 11$

Compressive yield strength of pipe (Driscopipe 1500 psi) $\sigma_a := 1500psi$ $\sigma_a = 10.342\,MPa$

Groundwater temperature $L_{temp} := 15$ °C

Pipe internal pressure (vacuum is negative) Groundwater and leachate pipes operate at normal atmospheric pressure $\Delta P_{int} := 0MPa$

Pressure on pipe

For deep burial the form of equations developed for incomplete projection should be used to determine the overburden pressure. This allows for the arching effect of materials across the pipe diameter.

Overburden pressure $P_{oNIP} := d \cdot \gamma_s$ $P_{oNIP} = 1224\,kPa$

Based upon incomplete projection (refer to separate calculations) (Max depth of waste 85m) $P_{oIP} := 517kPa$

Total applied pressure $P(P_o) := P_o - \Delta P_{int}$ $P(P_{oNIP}) = 1224\,kPa$

$P(P_{oIP}) = 517\,kPa$

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Correction for pipe perforations

If the leachate collection pipe is perforated, less cross sectional area of the pipe is carrying the applied external pressure than that which would be the case with a solid wall pipe. Therefore, a correction can be made to the external pressure to take account of the increase in stress in the pipe due to the perforations.

Perforation diameter $d_{perf} := 13mm$

Spacing of perforations $s_{perf} := 125mm$

Number of row of perforations $row_{num} := 3$

Effective length of perforations per unit length $L_p := d_{perf} \cdot row_{num} \cdot \frac{1m}{s_{perf}}$ $L_p = 0.312\,m$

Factored external pressure (to account for effect of perforations). $P_F(P) := P \cdot \frac{1m}{1m - L_p}$

$P_F(P(P_{oNIP})) = 1779\,kPa$

$P_F(P(P_{oIP})) = 751\,kPa$

Wall crushing

Wall crushing theoretically occurs when the stress in a pipe wall, due to external vertical pressure, exceeds the long-term compressive strength of the pipe material. To ensure that the pipe wall is strong enough to endure the external pressure:

Compressive stress in pipe $\sigma_c(P) := \frac{SDR - 1}{2} \cdot P$

$\sigma_c(P_F(P(P_{oNIP}))) = 8.895\,MPa$

$\sigma_c(P_F(P(P_{oIP}))) = 3.757\,MPa$

Soil strain $\varepsilon_s(P) := \frac{P}{E'}$

$\varepsilon_s(P_F(P(P_{oNIP}))) = 0.018$

$\varepsilon_s(P_F(P(P_{oIP}))) = 7.515 \times 10^{-3}$

Factor of safety against wall crushing $FoS_{wc}(P) := \frac{\sigma_a}{\sigma_c(P)}$

$FoS_{wc}(P_F(P(P_{oNIP}))) = 1.163$

$FoS_{wc}(P_F(P(P_{oIP}))) = 2.753$

Most manufactures consider that a factor of safety of 1 is sufficient

$Check1 := \begin{cases} \text{"Crushing FoS OK"} & \text{if } FoS_{wc}(P_F(P(P_{oNIP}))) \geq 1 \\ \text{"Crushing not OK"} & \text{otherwise} \end{cases}$

$Check2 := \begin{cases} \text{"Crushing FoS OK"} & \text{if } FoS_{wc}(P_F(P(P_{oIP}))) \geq 1 \\ \text{"Crushing not OK"} & \text{otherwise} \end{cases}$

Without taking into account incomplete projection $Check1 = \text{"Crushing FoS OK"}$

Taking into account incomplete projection $Check2 = \text{"Crushing FoS OK"}$

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Modulus of Elasticity for pipe

Instantaneous modulus of elasticity at reference temperature of 23°C

$E_{I23} := EI(23)$

$E_{I23} = 901.774\,MPa$

Instantaneous modulus of elasticity at temperature of leachate

$E_{Itemp} := EI(L_{temp})$

$E_{Itemp} = 1.043 \times 10^{3}\,MPa$

Design life 50 years

Elasticity to allow for compressive stress in pipe

$E_{stress}(p) := E50(\sigma_c(p))$

$E_{stress}(P_F(P(P_{oNIP}))) = 47\,MPa$

$E_{stress}(P_F(P(P_{oIP}))) = 125\,MPa$

Modulus of elasticity corrected for environmental conditions

$E_{penv}(P) := E_{stress}(P) \cdot \frac{E_{Itemp}}{E_{I23}}$

$E_{penv}(P_F(P(P_{oNIP}))) = 54\,MPa$

$E_{penv}(P_F(P(P_{oIP}))) = 145\,MPa$

Wall buckling

Local wall buckling is a longitudinal wrinkling of the pipe wall. Tests of non-pressurised Driscopipe show that buckling and collapse do not occur where the soil envelope is in full contact with the pipe and is compacted to a dense state.

However, it can be forced to occur over the long-term in non-pressurised pipe if the total external soil pressure P_t is allowed to exceed the pipe-soil system's critical buckling pressure P_{cb}. If $P_t > P_{cb}$ gradual collapse may occur over the long term. A calculated, conservative value for the critical buckling pressure may be obtained by the following approximate formula. All pipe diameters with the same SDR in the same burial condition have the same critical collapse and critical buckling endurance.

Critical collapse differential pressure

$P_c(P) := \frac{2.32 \cdot E_{penv}(P)}{SDR^3}$

$P_c(P_F(P(P_{oNIP}))) = 94\,kPa$

$P_c(P_F(P(P_{oIP}))) = 252\,kPa$

Critical Buckling pressure

$P_{cb}(P) := 0.8 \cdot \sqrt{E' \cdot P_c(P)}$

$P_{cb}(P_F(P(P_{oNIP}))) = 2\,MPa$

$P_{cb}(P_F(P(P_{oIP}))) = 4\,MPa$

Factor of safety against wall buckling

$FoS_{wb}(P) := \frac{P_{cb}(P)}{P}$

$FoS_{wb}(P_F(P(P_{oNIP}))) = 1.381$

$FoS_{wb}(P_F(P(P_{oIP}))) = 5.345$

A minimum acceptable factor of safety of 1 is considered to be acceptable because of the conservativeness in the method

$Check3 := \begin{cases} \text{"Buckling OK"} & \text{if } FoS_{wb}(P_F(P(P_{oNIP}))) \geq 1 \\ \text{"Buckling not OK"} & \text{otherwise} \end{cases}$

$Check4 := \begin{cases} \text{"Buckling OK"} & \text{if } FoS_{wb}(P_F(P(P_{oIP}))) \geq 1 \\ \text{"Buckling not OK"} & \text{otherwise} \end{cases}$

Without taking into account incomplete projection

Check3 = "Buckling OK"

Taking into account incomplete projection

Check4 = "Buckling OK"

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Ring deflection

Ring deflection is defined as the ratio of the vertical change in diameter to the original diameter. It is often expressed as a percentage.

Ring deflection for buried HDPE pipe is conservatively assumed to be the same as the vertical compression of the soil envelope around the pipe. Design by ring deflection matches the ability of the HDPE pipe to accommodate, without structural distress, the vertical compression of the soil enveloping the buried pipe.

The allowable ring deflection of HDPE pipe is a function of the allowable tangential strain in the outer surface of the pipe wall.

A limit of 1% to 1.5% tangential strain in the outer surface of the pipe wall due to vertical deflection of the pipe by soil compression is generally assumed to be conservatively accepted by most HDPE pipe manufactures. The allowable vertical strain (ring deflection) of the pipe of 2% to 8% does not result in a significant loss of cross sectional area or flow capacity of the pipe, since the deformed pipe has a larger horizontal dimension than that of the original pipe, which compensates for the loss of the vertical dimension.

Therefore a factor of safety of 1 for ring deflection is generally considered to be acceptable.

Vertical strain in the soil envelope

$\varepsilon_s(P_F(P(P_{oNIP}))) = 1.78\ \%$

$\varepsilon_s(P_F(P(P_{oIP}))) = 0.75\ \%$

Tangential strain in the outer surface of the pipe

$\varepsilon_t(P) := \frac{\varepsilon_s(P)}{0.25 \cdot SDR}$

$\varepsilon_t(P_F(P(P_{oNIP}))) = 0.65\ \%$

$\varepsilon_t(P_F(P(P_{oIP}))) = 0.27\ \%$

Allowable vertical strain in the pipe (SDR 11)

$\varepsilon_{pallow} := 2.7\%$

Factor of safety on ring deflection

$FoS_{rd}(P) := \frac{\varepsilon_{pallow}}{\varepsilon_s(P)}$

$FoS_{rd}(P_F(P(P_{oNIP}))) = 1.518$

$FoS_{rd}(P_F(P(P_{oIP}))) = 3.593$

$Check5 := \begin{cases} \text{"Ring deflection OK"} & \text{if } FoS_{rd}(P_F(P(P_{oNIP}))) \geq 1 \\ \text{"Ring deflection not OK"} & \text{otherwise} \end{cases}$

$Check6 := \begin{cases} \text{"Ring deflection OK"} & \text{if } FoS_{rd}(P_F(P(P_{oIP}))) \geq 1 \\ \text{"Ring deflection not OK"} & \text{otherwise} \end{cases}$

Without taking into account incomplete projection

Check5 = "Ring deflection OK"

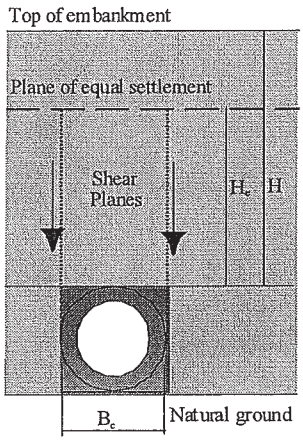
Taking into account incomplete projection

Check6 = "Ring deflection OK"

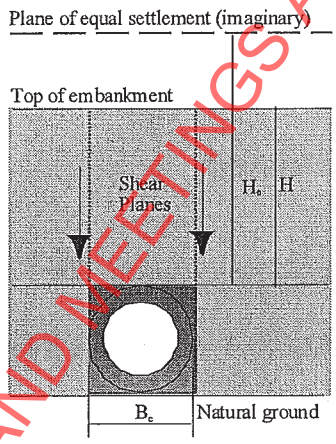
04 POSITIVE PROJECTION CONDITION (EMBANKMENT OR WIDE TRENCH) - LOAD ON PIPE

The pipe material is generally much stiffer than the fill beside it. Therefore, frictional forces from downdrag at the sides add to the pipe load. When H is relatively small the frictional slip planes are assumed to extend to the surface and this is termed "complete projection".

When H is large, the vertical slip planes are considered to peter out at a level known as the "plane of equal settlement" situated a height H_e. This situation is termed the "incomplete projection" condition.



Incomplete projection condition



Complete projection condition

Reference

TRRL 1983 "A guide to design loadings for buried pipes"

Parameters

Unit weight of backfill (rockfill and waste) $\gamma := \frac{5.5 \cdot 20 + 79.5 \cdot 14}{85} \text{kN} \cdot \text{m}^{-3}$ $\gamma = 14.4\,\text{kN} \cdot \text{m}^{-3}$

Back fill soil characteristics: The parameter Kμ is a semi-empirical constant which is a combination of :

- K the Active earth pressure coefficient; and
- μ the coeffcient of sliding friction within a mass of fill

The maximum value is generally adopted because this gives the worst case.

Descritpion of backfill	Ku	
Granular materials without cohesion	0.19	
Sand and gravel	0.165	max
Saturated top soil	0.15	max
Clay	0.13	ordinary max
Saturated clay	0.11	max

$K\mu := 0.19$

The settlement ratio is regarded as a semi-empirical constant and is a function of the pipe installation. Although theoretically negative values of r_{sd} can occur they are unlikely.

Foundation condition	rsd	
	min	max
Pipe laid on unyeilding foundation (eg rock)	1	1
Pipe laid on normal foundation	0.5	0.8
Pipe laid ion yeilding foundation	0	0.5

$r_{sd} := 1$

Positive projection ratio is that proportion of the pipe's external diameter that is a above the firm bedding level or natural ground. $p := 1$

Pipe outside diameter — Analysis for Leachate and GW pipes is same. Therefore, using larger diameter is conservative. $B_c := 250\text{mm}$

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Ranges

Minimum depth of cover $H_{min} := 1m$

Maximum depth of cover $H_{max} := 100m$

Complete projection

Load on pipe

$$W_{c_Comp}(H) := \frac{e^{2\cdot\left(K\mu\cdot\frac{H}{B_c}\right)} - 1}{2\cdot K\mu}\cdot\gamma\cdot B_c^{\,2}$$

Transition depth

Function to find transition depth:

$$fHe(H_e, H) := \left| \begin{array}{l} aa \leftarrow \dfrac{e^{2\cdot K\mu\cdot\frac{H_e}{B_c}} - 1}{2\cdot K\mu}\cdot\left[\dfrac{1}{2\cdot K\mu} + \left(\dfrac{H}{B_c} - \dfrac{H_e}{B_c}\right) + \dfrac{r_{sd}\cdot p}{3}\right] \\ bb \leftarrow \dfrac{1}{2}\cdot\left(\dfrac{H_e}{B_c}\right)^2 \\ cc \leftarrow \dfrac{r_{sd}\cdot p}{3}\left(\dfrac{H}{B_c} - \dfrac{H_e}{B_c}\right)\cdot e^{2\cdot K\mu\cdot\frac{H_e}{B_c}} \\ dd \leftarrow \dfrac{H_e}{2\cdot K\mu\cdot B_c} \\ ee \leftarrow \dfrac{H\cdot H_e}{B_c^{\,2}} \\ ff \leftarrow r_{sd}\cdot p\cdot\dfrac{H}{B_c} \\ aa + bb + cc - dd - ee - ff \end{array} \right.$$

Transition depth

$$H_e(H) := \left| \begin{array}{l} he \leftarrow 0.1m \\ s \leftarrow root(fHe(he, H), he) \end{array} \right.$$

Incomplete projection

Load on pipe as a function Spangler's formula

$$W_{c_Incomp}(H) := \left| \begin{array}{l} h_e \leftarrow H_e(H) \\ \left[\dfrac{e^{2\cdot K\mu\cdot\frac{h_e}{B_c}} - 1}{2\cdot K\mu} + \left(\dfrac{H}{B_c} - \dfrac{h_e}{B_c}\right)\cdot e^{2\cdot K\mu\cdot\frac{h_e}{B_c}}\right]\cdot\gamma\cdot B_c^{\,2} \end{array} \right.$$

Combined Formulation

When H is greater than He, the situation is termed the incomplete projection condition.

$$W_c(H) := \left| \begin{array}{l} h_e \leftarrow H_e(H) \\ W_{c_Comp}(H) \quad \text{if } H < h_e \\ W_{c_Incomp}(H) \quad \text{otherwise} \end{array} \right.$$

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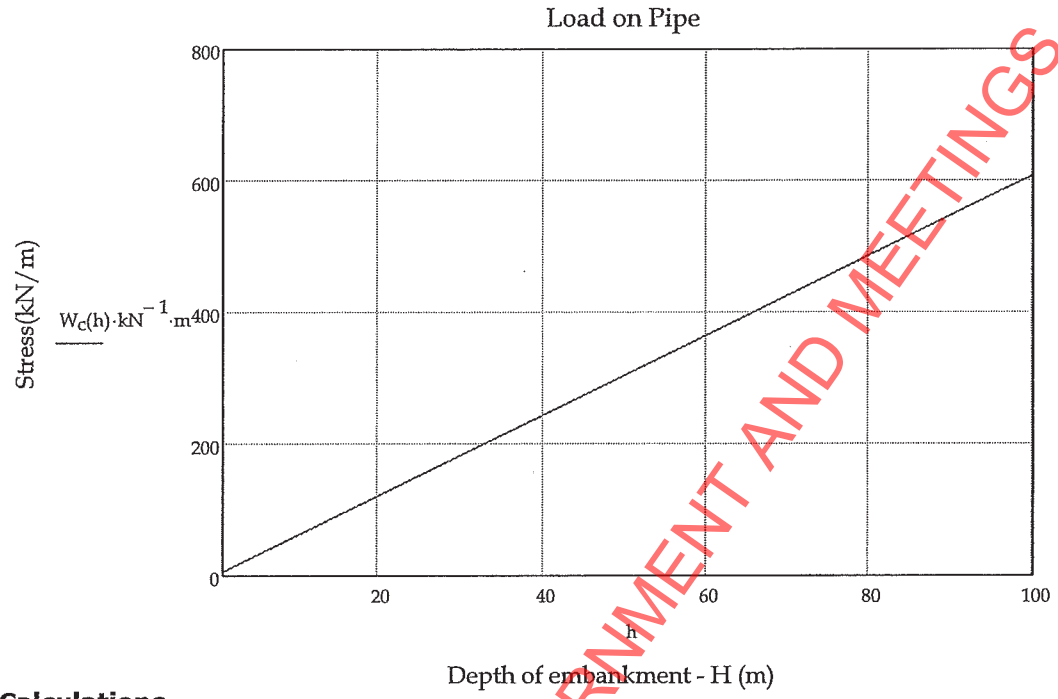
Results



Calculations

Depth h (m)	Transition depth H_e (m)	Stress on pipe (kN/m)
$h_1 := 5m$	$H_e(h_1) = 0.354\,m$	$W_c(h_1) = 30.321\,kN\cdot m^{-1}$
$h_2 := 85m$	$H_e(h_2) = 0.346\,m$	$W_c(h_2) = 517\,kN\cdot m^{-1}$

Design criteria for horizontal pipe strength $W_c(h_2) = 517.001\,kN\cdot m^{-1}$ (Enter into Sheet 03)

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05 GRANULAR FILTER DESIGN

References

GEO (1993) "Review of granular and geotextile filters" Hong Kong Civil Engineering Department Publication No 1/93

Material Parameters

1. Engineered Fill (HW Greywacke)

15% passing size of the fine limit of the filter material $D15_{Ff1} := 0.002mm$

15% passing size of the coarse limit of the soil material $D15_{Sc1} := 0.7mm$

$D15_{Fc1} := D15_{Sc1}$

85% passing of the fine limit of the material $D85_{Sf1} := 4mm$

10% passing of average PSD curve $D10_1 := 0.002mm$

60% passing of average PSD curve $D60_1 := 2mm$

Coefficient of Uniformity $CU_1 := \frac{D60_1}{D10_1}$ $CU_1 = 1000$

2. 40/20 Aggregate

15% passing size of the fine limit of the filter material $D15_{Ff2} := 19.1mm$

15% passing size of the coarse limit of the soil material $D15_{Sc2} := 19.1mm$

$D15_{Fc2} := D15_{Sc2}$

85% passing of the fine limit of the material $D85_{Sf2} := 33mm$

10% passing of average PSD curve $D10_2 := 17mm$

60% passing of average PSD curve $D60_2 := 25.4mm$

Coefficient of Uniformity $CU_2 := \frac{D60_2}{D10_2}$ $CU_2 = 1.5$

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3. 300/20 River run aggregate

15% passing size of the fine limit of the filter material $D15_{Ff3} := 30mm$

15% passing size of the coarse limit of the soil material $D15_{Sc3} := 35mm$

$D15_{Fc3} := D15_{Sc3}$

85% passing of the fine limit of the material $D85_{Sf3} := 110mm$

10% passing of average PSD curve $D10_3 := 17mm$

60% passing of average PSD curve $D60_3 := 126mm$

Coefficient of Uniformity $CU_3 := \frac{D60_3}{D10_3}$ $CU_3 = 7.4$

EQUATIONS

Rule 1

$$Rule_1(D85_{Sf}, D15_{Fc}) := \begin{cases} \text{"Stability OK"} & \text{if } D15_{Fc} \le 5 \cdot D85_{Sf} \\ \text{"Failed Rule 1"} & \text{otherwise} \end{cases}$$

Rule 2

$$Rule_2(D15_{Sc}, D15_{Ff}) := \begin{cases} \text{"Permeability is OK"} & \text{if } D15_{Ff} \ge 5 \cdot D15_{Sc} \\ \text{"Failed Rule 2"} & \text{otherwise} \end{cases}$$

Layer Compatability Results

A. Layer 1 and 2

$Rule_1(D85_{Sf1}, D15_{Fc2}) = \text{"Stability OK"}$

$Rule_2(D15_{Sc1}, D15_{Ff2}) = \text{"Permeability is OK"}$

B. Layer 2 and 3

$Rule_1(D85_{Sf2}, D15_{Fc3}) = \text{"Stability OK"}$

C. Layer 3 and 2

$Rule_1(D85_{Sf3}, D15_{Fc2}) = \text{"Stability OK"}$

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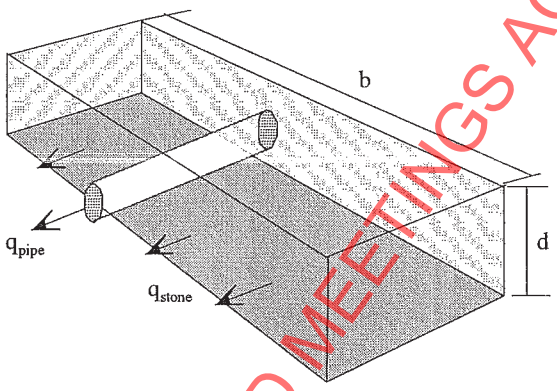
06 GROUNDWATER BENCH DRAINS

The total flow capacity of the groundwater bench drains is a combination of the flow in the granular media and the flow in the header pipes.

The capacity of the gravel drainage layer is estimated using Darcy's equation. Where the slope of the formation determines the hydraulic gradient of the flow.

The capacity of the groundwater bench drains is estimated using the Colebrook-White equation.



Units

litre := $10^{-3}m^3$

Parameters

Gravel Drainage Layer

Permeability of drainage stone		$k_1 := 10^{-1}m \cdot s^{-1}$
Depth of drainage layer		$D_1 := 0.3m$
Average breadth of drainage layer at critical point		$B_1 := 0.8m$
Slope of drainage layer (1:X)		$X_1 := 20$

Groundwater bench pipes

Adopt the longterm condition of the pipe, it is likely to become slimed over the years of service.

Roughness coefficient in mm (slimed perforated HDPE pipe)		$k_s := 0.3mm$
Temperature of groundwater		$t := 15$ °C
Internal diameter of GW bench pipes	Min ID (110mmOD SDR11)	$Dia_{GWbch.} := 0.088 \cdot m$
Slope of groundwater pipe (1:X)		$X_2 := 20$

Design flow

Estimated groundwater flow at each bench (Half the estimated flow in base)		$Q_{GWbch} := 1.0\ litre \cdot s^{-1}$
		$FoS_{GW} := 4$
Design groundwater flow at each bench	$Q_{GWbchDes} := Q_{GWbch} \cdot FoS_{GW}$	$Q_{GWbchDes} = 4\ litre \cdot s^{-1}$
		$Q_{GWbchDes} = 346\ m^3 \cdot day^{-1}$

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Equations

Flow rate in drainage pipes

Function for pipe full flow $q_{pipe}(x, D) :=$

$v \leftarrow \frac{40 \cdot 10^{-6} \cdot m^2 \cdot s^{-1}}{20 + t}$

Wetted Area $A \leftarrow \frac{\pi \cdot D^2}{4}$

Wetted Perimeter $P \leftarrow D \cdot \pi$

Hydraulic radius $R \leftarrow \frac{A}{P}$

Colebrook-White equation $v \leftarrow -\left(\sqrt{32 \cdot g \cdot R \cdot \frac{1}{x}} \cdot \log\left(\frac{k_s}{14.8 \cdot R} + \frac{1.255 \cdot v}{R \cdot \sqrt{32 \cdot g \cdot R \cdot \frac{1}{x}}}\right)\right)$

Flow $A \cdot v$

Flow in the gravel drainage layer

Flow rate $q_{stone}(k, d, b, x) := k \cdot \frac{1}{x} \cdot d \cdot b$

Results

Pipe Capacity

Capacity of groundwater bench pipes $q_{pipeGWbch} := q_{pipe}(X_2, Dia_{GWbch.})$ $q_{pipeGWbch} = 10.7\,litre \cdot s^{-1}$

Check1 := "Insufficient capacity in groundwater bench pipes" if $q_{pipeGWbch} < Q_{GWbchDes}$
"Sufficient capacity in groundwater bench pipes" otherwise

Check1 = "Sufficient capacity in groundwater bench pipes"

Gravel drainage layer (worst case: pipe sheared)

Capacity of drainage stone $q_{stone1} := q_{stone}(k_1, D_1, B_1, X_1)$ $q_{stone1} = 1.20\,litre \cdot s^{-1}$

Total capacity of layer (pipes intact) $q_{total1} := q_{stone1} + q_{pipeGWbch}$ $q_{total1} = 12\,litre \cdot s^{-1}$

Check2 := "Insufficient capacity in gravel" if $q_{stone1} < Q_{GWbch}$
"Sufficient capacity in gravel" otherwise

Check2 = "Sufficient capacity in gravel"

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Appendix B: Stage 1/1A leachate simulation

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- **Appendix B1 Analysis using on site rainfall data**

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01 STOCHASTIC CROSS CORRELATION - ON SITE RAINFALL DATA

The response of the regime can be determined by a statistical analysis of the time series response of the regime as a whole. This approach implicitly incorporates all the physical factors influencing the regime without distinguishing any factor in particular except for rainfall.

References

N. Kresic (1997) "Quantitative Solutions in Hydrogeology and Groundwater Modelling" Lewis Publishers ISBN 0 56670 219 4 pp 293

Catchment Parameters

The time after rainfall before there is any contribution to leachate generation is

lag := 0 days

Correlation parameters

Maximum analysis lag - for small data sets this should be about 10% of the length of the data set - for large data sets one year or more it can be upto 30% of the length of the data set

$K_{lag} := 35$ days

Normally distributed standardised variable at the α level of confidence

Level of significance	0.1	0.05	0.01	0.005	0.002
	90%	95%	99%	99.50%	99.80%

Z for one tail test	1.28	1.645	2.33	2.58	2.88
Z for two tail test	1.645	1.96	2.58	2.81	3.08

The level of confidence that a rainfall record does not contribute to the leachate generation on a particular day is taken as 95%

$Z_\alpha := 1.645$

Data for cross correlation coefficients

Data for rainfall and leachate collection 01 Jan 2001 to 31 March 2006

Note: Onsite rainfall data for the period between 1 May 2005 - 12 January 2006 is unavailable and off site data has been substituted in its place

Data1 :=

	0	1
0	0	630.72
1	0	630.72
2	0	630.72
3	0	630.72
4	0	630.72
5	0	630.72

Total number of daily records $N1 := \text{last}(Data1^{\langle 0 \rangle})$ N1 = 1915 days

Rainfall data (mm/day) $x1 := Data1^{\langle 0 \rangle}$

Leachate collection data (m^3/day) $y1 := Data1^{\langle 1 \rangle}$

Correlation equations

Confidence upper limit $$LC1(k,N) := \frac{1 + Z_\alpha \cdot \sqrt{N-k-2}}{N-k-1}$$

Confidence lower limit $$LC2(k,N) := \frac{1 - Z_\alpha \cdot \sqrt{N-k-2}}{N-k-1}$$

The cross correlation coefficient for a lag of k

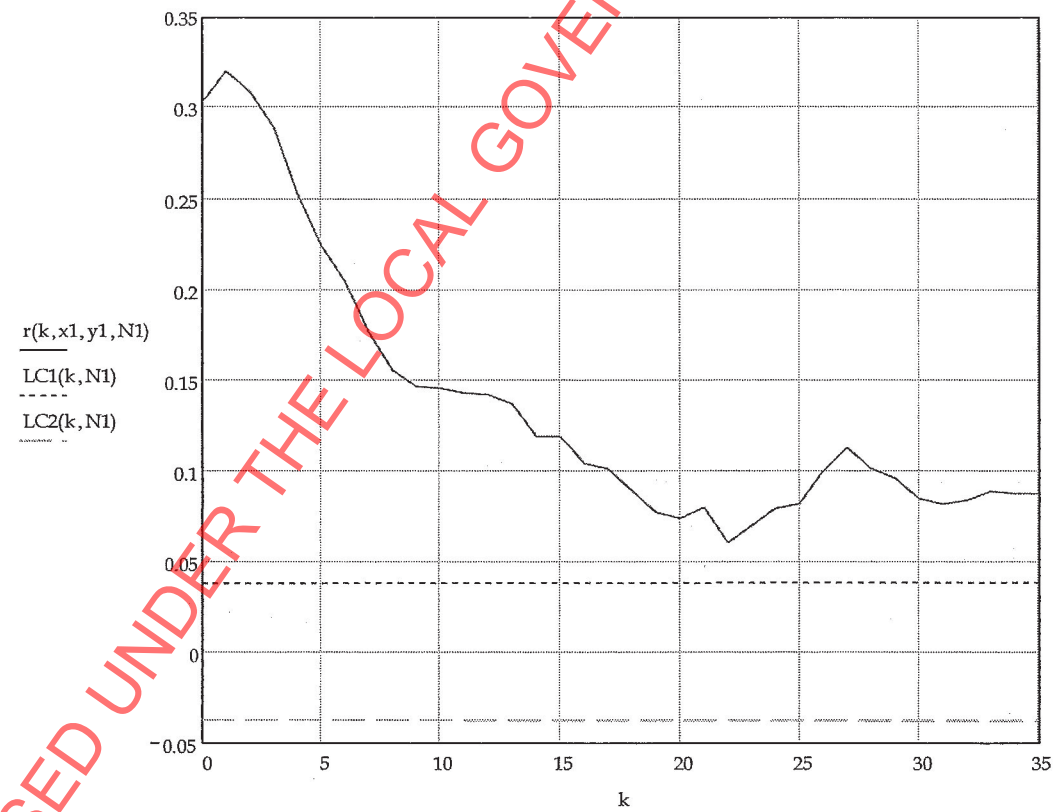
$$r(k,x,y,N) := \frac{\sum_{i=1}^{N-k}\left(x_i \cdot y_{i+k}\right) - \frac{1}{N-k}\cdot\sum_{i=1}^{N-k} x_i \cdot \sum_{i=1}^{N-k} y_{i+k}}{\left[\sum_{i=1}^{N-k}\left(x_i\right)^2 - \frac{1}{N-k}\cdot\left(\sum_{i=1}^{N-k} x_i\right)^2\right]^{0.5}\cdot\left[\sum_{i=1}^{N-k}\left(y_{i+k}\right)^2 - \frac{1}{N-k}\cdot\left(\sum_{i=1}^{N-k} y_{i+k}\right)^2\right]^{0.5}}$$

Range of interest for graphs $k := 0 .. K_{lag}$

Results of cross correlation

Results of cross correlation with 95% probability

Data for 01 Jan 2001 to 31 March 2006



Lag in days

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Contribution of rainfall

Not all the rainfall in the lag period contributes equally to the leachate generation on any given day. The following determines the contribution distribution throughout the lag period.

Maximum lag in the regime $K_{lag} = 35$ days

A counter $i := 0 .. K_{lag}$

Contribution in the lag period (int)
Is the difference between the regression coefficient and the upper bound of the confidence limit.

$$dif(i) := \begin{cases} d \leftarrow r(i, x1, y1, N1) - LC1(i, N1) \\ d \text{ if } d > 0 \\ 0 \text{ otherwise} \end{cases}$$

sum of the differences $Sum_{diff} := \sum_{i=0}^{K_{lag}} dif(i)$ $Sum_{diff} = 3.554$

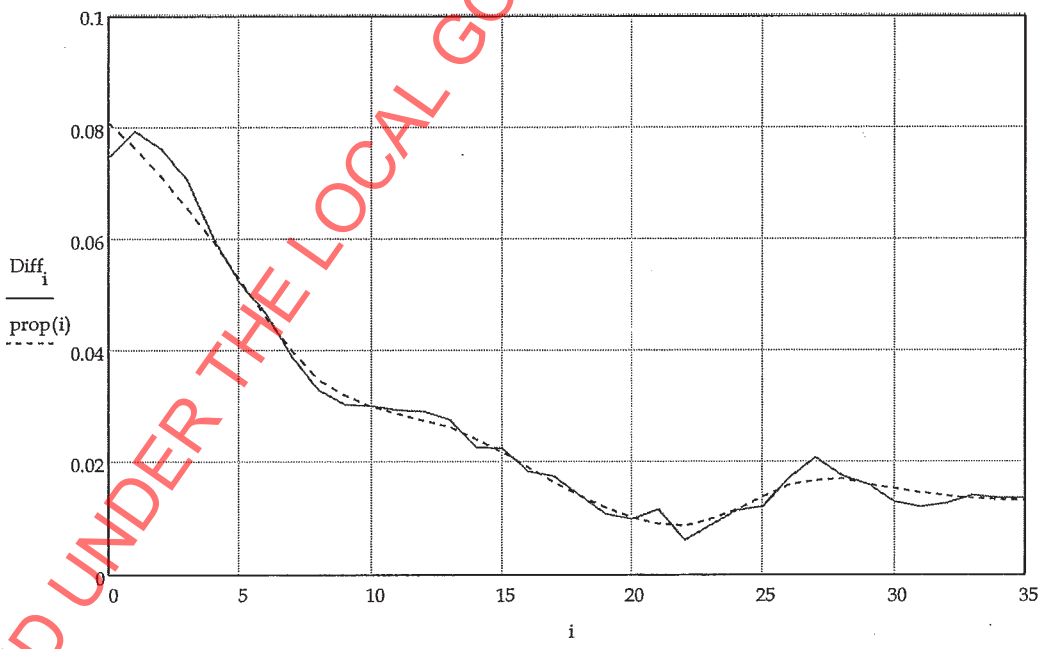
Proportional contribution of rainfall $Diff_i := \frac{dif(i)}{Sum_{diff}}$ $\sum_{i=0}^{K_{lag}} Diff_i = 1$

An array representing the lag day $Day_i := i$

Create a smooth function to describe the function

$p := loess(Day, Diff, 0.4)$

$$prop(d) := \begin{cases} num \leftarrow interp(p, Day, Diff, d) \\ 0 \text{ if } num \le 0 \\ num \text{ otherwise} \end{cases}$$



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02 LANDFILL LEACHATE SIMULATION OPERATING LANDFILL ON SITE RAINFALL DATA

The contribution of a rainfall event on a particular day provides a response in the leachate collection systems that is dispersed over a number of days that follow. For many landfills, across a wide range of plan areas, this is about four days. The response is not an average across the four days, but has a peak before it diminishes towards the end of the period.

Units

$ha := 10^4 \cdot m^2$

Parameters

Cap type	Area of cap type	Proportion of rainfall that infiltrates cap type	
Open active areas	$A_{active} := 1ha$	$Inf_{active} := 100\%$	
Short term interim cover	$A_{Stemp} := 6ha$	$Inf_{Stemp} := 13\%$	
Long term interim cover	$A_{Ltemp} := 10ha$	$Inf_{Ltemp} := 5\%$	
Groundwater catchment	$A_{GW} := 35ha$	$Inf_{GW} := 15\%$	
Base flow from waste mass		$Bflow := 0m^3 \cdot day^{-1}$	
Groundwater baseflow		$Bflow_{grd} := 290m^3 \cdot day^{-1}$	
The lag in the landfill waste and collection system before a rainfall event on a particular day has any measurable effect at the leachate collection system outlet.	There are short cut routes through the waste mass to the collection system and the lag is generally zero days	$lagSys := 0$	days
		$lagSys_{Grd} := 23$	days
The time over which a rainfall event will contribute to the flow in the leachate collection system	This is generally only a few days, for an average landfill of a few hectares, or a landfill consisting of cells of <10 hectares this is in the order of 4 days. For a landfill of effectively one cell of about 60 hectares it can be 8 days.	$DurRain := 20$	days
The time over which a rainfall event on the groundwater catchment will contribute to the flow in the collection system		$DurGrd := 12$	days

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Landfill response characteristic

The following determines the contribution distribution throughout the lagRain period.

Not all the rainfall in the period of contribution to collection flows contributes equally to the leachate the collection flow on any given day.

"Char" is modified to match the leachate regime. Enter the values from the Stochastic Cross Correlation sheet to model the shape of the leachate regime.

Char :=

	0	1
0	0	0.1
1	1	0.07
2	2	0.06
3	3	0.05
4	4	0.04
5	5	0.03
6	6	0.02
7	7	0.02
8	8	0.02
9	9	0.01
10	10	0.01

Total number of daily records

$Nchar := last(Char^{\langle 0 \rangle})$

Nchar = 10 days

Corrected periods for the length of the required characteristic

$$x1 := \frac{Char^{\langle 0 \rangle} \cdot DurRain}{Nchar}$$

Proportion of rainfall contributing in a particular interval

$y1 := Char^{\langle 1 \rangle}$

Function representing the proportion of rainfall allocated to each of the intervals

$p := loess(x1, y1, 0.75)$

Discount the values that are less than zero

$$prop1(d) := \begin{cases} num \leftarrow interp(p, x1, y1, d) \\ 0 \text{ if } num \le 0 \\ num \text{ otherwise} \end{cases}$$

Factor to determine the difference in total rainfall contribution over lagRain

$$Factor := \sum_{i=0}^{DurRain} prop1(i)$$

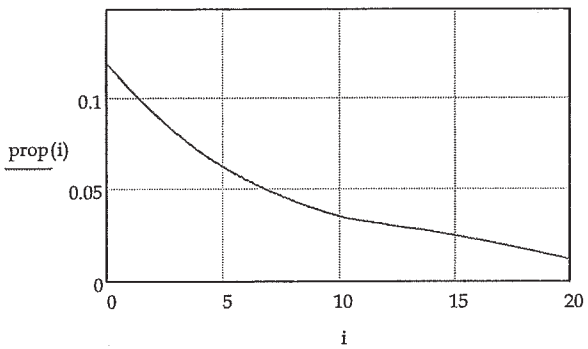
Factor = 0.811

Function for apportioning rainfall contribution on a daily basis

$$prop(d) := \frac{1}{Factor} \cdot prop1(d)$$

Check that the total rainfall contribution sums to unity

$$\sum_{i=0}^{DurRain} prop(i) = 1$$



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Groundwater response characteristic

The following determines the contribution distribution throughout the lagRain period.

$Char_{grd} :=$

	0	1
0	0	0.01
1	1	0.01
2	2	0.01
3	3	0.02
4	4	0.02
5	5	0.02
6	6	0.02
7	7	0.02
8	8	0.02
9	9	0.01
10	10	0.01
11	11	0.01
12	12	0.01

Not all the rainfall in the period of contribution to collection flows contributes equally to the groundwater collection flow on any given day.

"Char.grd" is modified to match the groundwater regime. Enter the values from the Stochastic Cross Correlation sheet to model the shape of the groundwater regime.

Total number of daily records

$Nchar_{grd} := last\left(Char_{grd}^{\langle 0 \rangle}\right)$

$Nchar_{grd} = 12$ days

Corrected periods for the length of the required characteristic

$$Gx1 := \frac{Char_{grd}^{\langle 0 \rangle} \cdot DurGrd}{Nchar_{grd}}$$

Proportion of rainfall contributing in a particular interval

$Gy1 := Char_{grd}^{\langle 1 \rangle}$

Function representing the proportion of rainfall allocated to each of the intervals

$Gp := loess(Gx1, Gy1, 0.75)$

Discount the values that are less than zero

$$Gprop1(d) := \begin{cases} num \leftarrow interp(Gp, Gx1, Gy1, d) \\ 0 \text{ if } num \le 0 \\ num \text{ otherwise} \end{cases}$$

Factor to determine the difference in total rainfall contribution over lagRain

$$GFactor := \sum_{i=0}^{DurGrd} Gprop1(i)$$

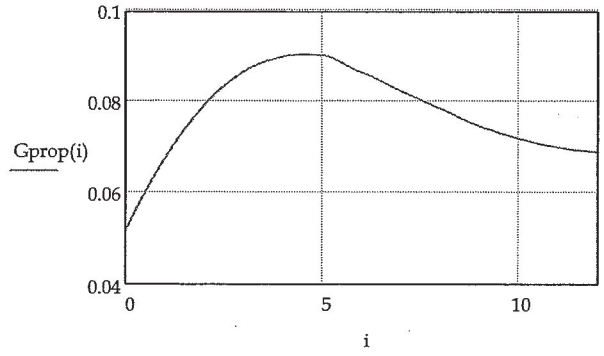
$GFactor = 0.186$

Function for apportioning rainfall contribution on a daily basis

$$Gprop(d) := \frac{1}{GFactor} \cdot Gprop1(d)$$

Check that the total rainfall contribution sums to unity

$$\sum_{i=0}^{DurGrd} Gprop(i) = 1$$



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Leachate collection flow function

Simulated leachate flow rate.

The leachate on an particular day is the sum of the contributions from the rainfalls on all previous days from "lagRain+lagSys" to day "lagSys". The proportion of the each rainfall event is determined by "prop".

The relevant proportion "prop" has to be measured forwards fror d - lagRain to i.

$$Simul(d,R,A,I) := \left| \begin{array}{l} bb \leftarrow \sum_{i=d-(DurRain+lagSys)}^{d-lagSys} \left(R_i \cdot prop(DurRain + i - d)\right) \\ bb \cdot A \cdot I \cdot day^{-1} \end{array} \right.$$

Calculations excludes baseflow which is taken into account below

The relevant proportion "Gprop" has to be measured forwards from d - lagGrd to i

$$GSimul(d,R,A,I) := \left| \begin{array}{l} aa \leftarrow Bflow_{grd} \\ bb \leftarrow \sum_{i=d-(DurGrd+lagSys)}^{d-lagSys} \left(R_i \cdot Gprop(DurGrd + i - d)\right) \\ aa + bb \cdot A \cdot I \cdot day^{-1} \end{array} \right.$$

Leachate collection flow

A long-term prediction of the response of the landfill collection system is derived on the basis of a long-term rainfall pattern.

Silverstream on site record - 01 Jan 2001 to 31 March 2006.

Histrec :=

	0	1
0	0	630.72
1	0	630.72
2	0	630.72
3	0	630.72
4	0	630.72
5	0	630.72
6	0	630.72
7	0	630.72
8	0	630.72
9	0	630.72
10	0	507.17
11	0	507.17
12	0	507.17
13	0	507.17
14	0	507.17
15	0	507.17

Note: Onsite rainfall data for the period between 1 May 2005 - 12 January 2006 is unavailable and off site data has been substituted in its place

Number of records $RecN := last\left(Histrec^{\langle 0 \rangle}\right)$

$RecN = 1915$

Rainfall $HRain := Histrec^{\langle 0 \rangle} \cdot mm$

Leachate $HLeach := Histrec^{\langle 1 \rangle} \cdot m^3 \cdot day^{-1}$

Counter for leachate $i := (DurRain + lagSys) .. RecN$

Counter for Groundwater $j := (DurGrd + lagSys) .. RecN$

Step for data maximum of lagRain and lagGrd

$Adjust := \max(DurRain, DurGrd)$ $Adjust = 20$

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Leachate collection flow simulation

$$Leach_i := \left| \begin{array}{l} a \leftarrow Simul(i, HRain, A_{active}, Inf_{active}) \\ b \leftarrow Simul(i, HRain, A_{Stemp}, Inf_{Stemp}) \\ c \leftarrow Simul(i, HRain, A_{Ltemp}, Inf_{Ltemp}) \\ a + b + c + Bflow \end{array} \right.$$

Groundwater contribution

$$Grdwater_j := GSimul(j, HRain, A_{GW}, Inf_{GW})$$

Disregard data for DurGrd at beginning and end of calculation

$$k := 0 .. last(Grdwater) - Adjust$$

Combined flow

$$TotLeach_k := Leach_{k+Adjust} + Grdwater_{k+Adjust}$$

Historical flow

$$HistLeach_k := HLeach_{k+Adjust}$$

Compare reliable historical flow with simulation

Ignore the first (Dfirst) days

$$D_{first} := 400$$

Ignore the last (Dlast) days

$$D_{last} := 0$$

Total number of records used in the comparison

$$N1 := last(HistLeach) - D_{first} - D_{last} \qquad N1 = 1495$$

Counter for selection of days

$$n := 0 .. N1$$

Flow data

$$RelFlow_n := HistLeach_{n+D_{first}}$$

Sumulation

$$SimFlow_n := TotLeach_{n+D_{first}}$$

Check simulation

$$\frac{\sum SimFlow}{\sum RelFlow} = 1.007$$

	Predicted	***Actual***
Maximum leachate collection	$max(SimFlow) = 1900\,m^3 \cdot day^{-1}$	$max(RelFlow) = 1573\,m^3 \cdot day^{-1}$
Average leachate collection	$mean(SimFlow) = 505\,m^3 \cdot day^{-1}$	$mean(RelFlow) = 501\,m^3 \cdot day^{-1}$

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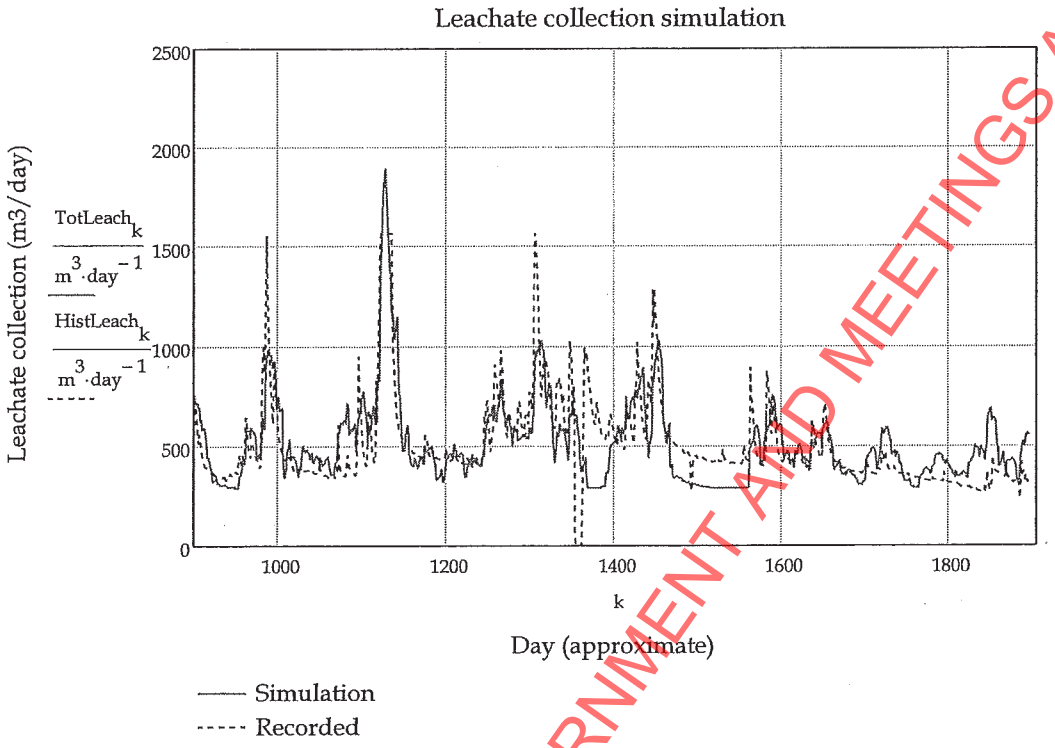

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03 LANDFILL LEACHATE SIMULATION CLOSED LANDFILL ON SITE RAINFALL DATA

The contribution of a rainfall event on a particular day provides a response in the leachate collection systems that is dispersed over a number of days that follow. For many landfills, across a wide range of plan areas, this is about four days. The response is not an average across the four days, but has a peak before it diminishes towards the end of the period.

Units

$ha := 10^4 \cdot m^2$

Parameters

Cap type	Area of cap type	Proportion of rainfall that infiltrates cap type
Open active areas	$A_{active} := 0ha$	$Inf_{active} := 100\%$
Short term interim cover	$A_{Stemp} := 0ha$	$Inf_{Stemp} := 13\%$
Long term interim cover	$A_{Ltemp} := 7.5ha$	$Inf_{Ltemp} := 5\%$
Groundwater catchment	$A_{GW} := 35ha$	$Inf_{GW} := 15\%$
Base flow from waste mass		$Bflow := 0m^3 \cdot day^{-1}$
Groundwater baseflow		$Bflow_{grd} := 290m^3 \cdot day^{-1}$
The lag in the landfill waste and collection system before a rainfall event on a particular day has any measurable effect at the leachate collection system outlet.	There are short cut routes through the waste mass to the collection system and the lag is generally zero days	$lagSys := 0$ days $lagSys_{Grd} := 23$ days
The time over which a rainfall event will contribute to the flow in the leachate collection system	This is generally only a few days, for an average landfill of a few hectares, or a landfill consisting of cells of <10 hectares this is in the order of 4 days. For a landfill of effectively one cell of about 60 hectares it can be 8 days.	$DurRain := 20$ days
The time over which a rainfall event on the groundwater catchment will contribute to the flow in the collection system		$DurGrd := 12$ days

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Landfill response characteristic

The following determines the contribution distribution throughout the lagRain period.

Not all the rainfall in the period of contribution to collection flows contributes equally to the leachate the collection flow on any given day.

"Char" is modified to match the leachate regime. Enter the values from the Stochastic Cross Correlation sheet to model the shape of the leachate regime.

Char :=

	0	1
0	0	0.1
1	1	0.07
2	2	0.06
3	3	0.05
4	4	0.04
5	5	0.03
6	6	0.02
7	7	0.02
8	8	0.02
9	9	0.01
10	10	0.01

Total number of daily records

$Nchar := last\left(Char^{\langle 0 \rangle}\right)$

Nchar = 10 days

Corrected periods for the length of the required characteristic

$$x1 := \frac{Char^{\langle 0 \rangle} \cdot DurRain}{Nchar}$$

Proportion of rainfall contributing in a particular interval

$y1 := Char^{\langle 1 \rangle}$

Function representing the proportion of rainfall allocated to each of the intervals

$p := loess(x1, y1, 0.75)$

Discount the values that are less than zero

$$prop1(d) := \begin{| num \leftarrow interp(p, x1, y1, d) \\ 0 \text{ if } num \le 0 \\ num \text{ otherwise}$$

Factor to determine the difference in total rainfall contribution over lagRain

$$Factor := \sum_{i=0}^{DurRain} prop1(i)$$

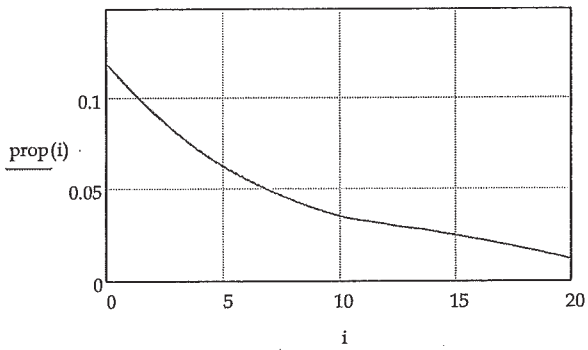
Factor = 0.811

Function for apportioning rainfall contribution on a daily basis

$$prop(d) := \frac{1}{Factor} \cdot prop1(d)$$

Check that the total rainfall contribution sums to unity

$$\sum_{i=0}^{DurRain} prop(i) = 1$$



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Groundwater response characteristic

The following determines the contribution distribution throughout the lagRain period.

$Char_{grd} :=$

	0	1
0	0	0.01
1	1	0.01
2	2	0.01
3	3	0.02
4	4	0.02
5	5	0.02
6	6	0.02
7	7	0.02
8	8	0.02
9	9	0.01
10	10	0.01
11	11	0.01
12	12	0.01

Not all the rainfall in the period of contribution to collection flows contributes equally to the groundwater collection flow on any given day.

"Char.grd" is modified to match the groundwater regime. Enter the values from the Stochastic Cross Correlation sheet to model the shape of the groundwater regime.

Total number of daily records

$Nchar_{grd} := last\left(Char_{grd}^{\langle 0 \rangle}\right)$

$Nchar_{grd} = 12$ days

Corrected periods for the length of the required characteristic

$$Gx1 := \frac{Char_{grd}^{\langle 0 \rangle} \cdot DurGrd}{Nchar_{grd}}$$

Proportion of rainfall contributing in a particular interval

$Gy1 := Char_{grd}^{\langle 1 \rangle}$

Function representing the proportion of rainfall allocated to each of the intervals

$Gp := loess(Gx1, Gy1, 0.75)$

Discount the values that are less than zero

$$Gprop1(d) := \begin{cases} num \leftarrow interp(Gp, Gx1, Gy1, d) \\ 0 \text{ if } num \le 0 \\ num \text{ otherwise} \end{cases}$$

Factor to determine the difference in total rainfall contribution over lagRain

$$GFactor := \sum_{i=0}^{DurGrd} Gprop1(i)$$

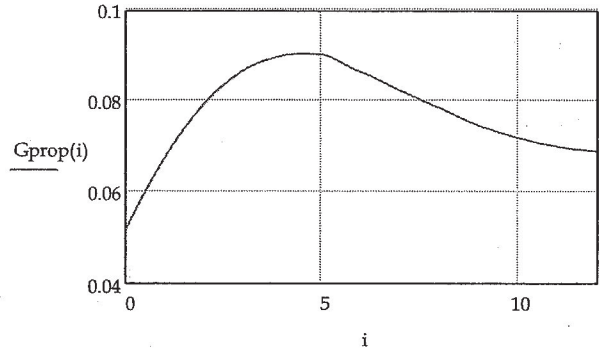
$GFactor = 0.186$

Function for apportioning rainfall contribution on a daily basis

$$Gprop(d) := \frac{1}{GFactor} \cdot Gprop1(d)$$

Check that the total rainfall contribution sums to unity

$$\sum_{i=0}^{DurGrd} Gprop(i) = 1$$



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Leachate collection flow function

Simulated leachate flow rate.

The leachate on an particular day is the sum of the contributions from the rainfalls on all previous days from "lagRain+lagSys" to day "lagSys". The proportion of the each rainfall event is determined by "prop".

The relevant proportion "prop" has to be measured forwards fror d - lagRain to i.

$$Simul(d,R,A,I) := \left| \begin{array}{l} bb \leftarrow \sum_{i=d-(DurRain+lagSys)}^{d-lagSys} \left(R_i \cdot prop(DurRain+i-d)\right) \\ bb \cdot A \cdot I \cdot day^{-1} \end{array} \right.$$

Calculations exclude baseflow which is taken into account below

The relevant proportion "Gprop" has to be measured forwards from d - lagGrd to i

$$GSimul(d,R,A,I) := \left| \begin{array}{l} aa \leftarrow Bflow_{grd} \\ bb \leftarrow \sum_{i=d-(DurGrd+lagSys)}^{d-lagSys} \left(R_i \cdot Gprop(DurGrd+i-d)\right) \\ aa + bb \cdot A \cdot I \cdot day^{-1} \end{array} \right.$$

Leachate collection flow

A long-term prediction of the response of the landfill collection system is derived on the basis of a long-term rainfall pattern.

Silverstream on site record - 01 Jan 2001 to 31 March 2006.

Histrec :=

	0	1
0	0	630.72
1	0	630.72
2	0	630.72
3	0	630.72
4	0	630.72
5	0	630.72
6	0	630.72
7	0	630.72
8	0	630.72
9	0	630.72
10	0	507.17
11	0	507.17
12	0	507.17
13	0	507.17
14	0	507.17
15	0	507.17

Note: Onsite rainfall data for the period between 1 May 2005 - 12 January 2006 is unavailable and off site data has been substituted in its place

Number of records $RecN := last\left(Histrec^{\langle 0 \rangle}\right)$

$RecN = 1915$

Rainfall $HRain := Histrec^{\langle 0 \rangle} \cdot mm$

Leachate $HLeach := Histrec^{\langle 1 \rangle} \cdot m^3 \cdot day^{-1}$

Counter for leachate $i := (DurRain + lagSys) .. RecN$

Counter for Groundwater $j := (DurGrd + lagSys) .. RecN$

Step for data maximum of lagRain and lagGrd

$Adjust := max(DurRain, DurGrd)$ $Adjust = 20$

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Leachate collection flow simulation

$$Leach_i := \left| \begin{array}{l} a \leftarrow Simul(i, HRain, A_{active}, Inf_{active}) \\ b \leftarrow Simul(i, HRain, A_{Stemp}, Inf_{Stemp}) \\ c \leftarrow Simul(i, HRain, A_{Ltemp}, Inf_{Ltemp}) \\ a + b + c + Bflow \end{array} \right.$$

Groundwater contribution

$$Grdwater_j := GSimul(j, HRain, A_{GW}, Inf_{GW})$$

Disregard data for DurGrd at beginning and end of calculation

$$k := 0 .. last(Grdwater) - Adjust$$

Combined flow

$$TotLeach_k := Leach_{k+Adjust} + Grdwater_{k+Adjust}$$

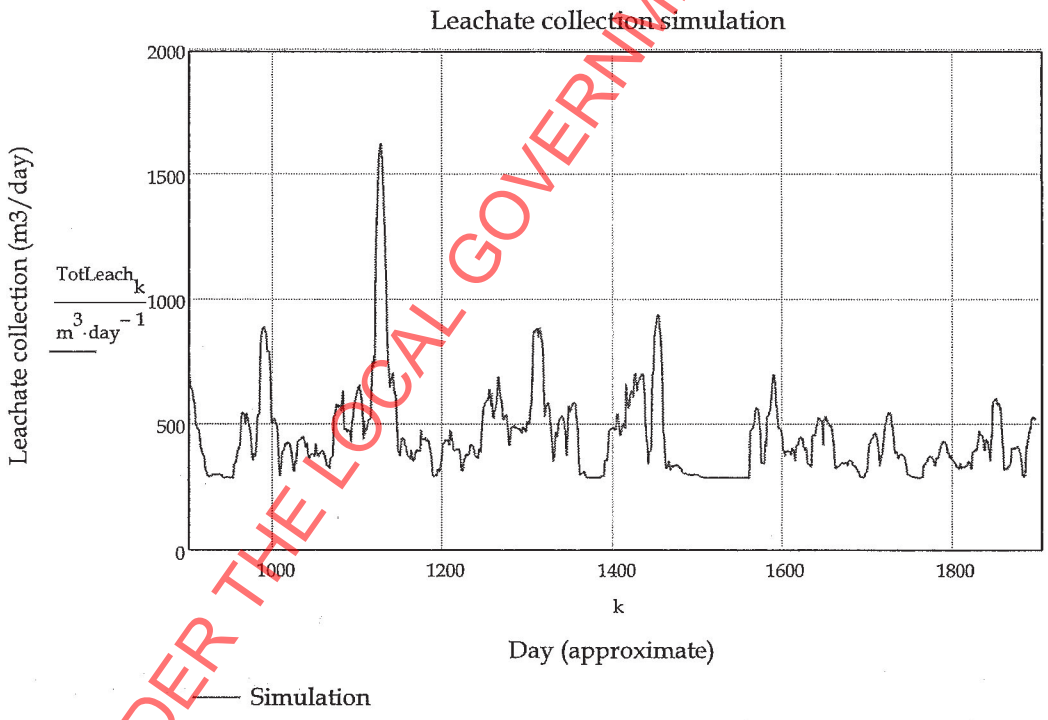
Predicted

Maximum leachate collection

$$\max(TotLeach) = 1631\,m^3 \cdot day^{-1}$$

Average leachate collection

$$mean(TotLeach) = 431\,m^3 \cdot day^{-1}$$



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- **Appendix B2 Analysis using off site rainfall data**

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01 STOCHASTIC CROSS CORRELATION - OFF SITE RAINFALL DATA

The response of the regime can be determined by a statistical analysis of the time series response of the regime as a whole. This approach implicitly incorporates all the physical factors influencing the regime without distinguishing any factor in particular except for rainfall.

References

N. Kresic (1997) "Quantitative Solutions in Hydrogeology and Groundwater Modelling" Lewis Publishers ISBN 0 56670 219 4 pp 293

Catchment Parameters

The time after rainfall before there is any contribution to leachate generation is

lag := 0 days

Correlation parameters

Maximum analysis lag - for small data sets this should be about 10% of the length of the data set - for large data sets one year or more it can be upto 30% of the length of the data set

$K_{lag} := 35$ days

Normally distributed standardised variable at the α level of confidence

Level of significance	0.1	0.05	0.01	0.005	0.002
	90%	95%	99%	99.50%	99.80%

Z for one tail test	1.28	1.645	2.33	2.58	2.88
Z for two tail test	1.645	1.96	2.58	2.81	3.08

The level of confidence that a rainfall record does not contribute to the leachate generation on a particular day is taken as 95%

$Z_\alpha := 1.645$

Data for cross correlation coefficients

Data for rainfall and leachate collection 01 Jan 2001 to 31 March 2006

Data1 :=

	0	1
0	0	630.72
1	0	630.72
2	0	630.72
3	0	630.72
4	0	630.72
5	0	630.72

Total number of daily records $N1 := last(Data1^{\langle 0 \rangle})$ N1 = 1915 days

Rainfall data (mm/day) $x1 := Data1^{\langle 0 \rangle}$

Leachate collection data (m^3/day) $y1 := Data1^{\langle 1 \rangle}$

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Correlation equations

Confidence upper limit $$LC1(k,N) := \frac{1 + Z_\alpha \cdot \sqrt{N-k-2}}{N-k-1}$$

Confidence lower limit $$LC2(k,N) := \frac{1 - Z_\alpha \cdot \sqrt{N-k-2}}{N-k-1}$$

The cross correlation coefficient for a lag of k

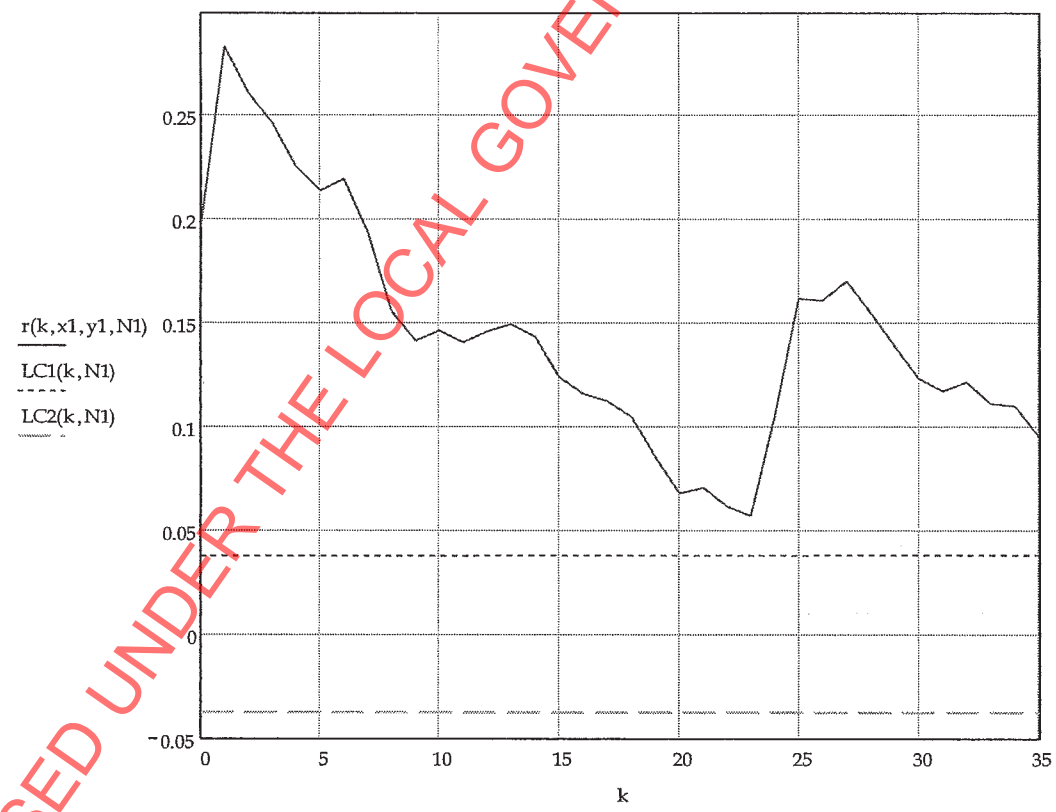
$$r(k,x,y,N) := \frac{\sum_{i=1}^{N-k} (x_i \cdot y_{i+k}) - \frac{1}{N-k} \cdot \sum_{i=1}^{N-k} x_i \cdot \sum_{i=1}^{N-k} y_{i+k}}{\left[\sum_{i=1}^{N-k} (x_i)^2 - \frac{1}{N-k} \cdot \left(\sum_{i=1}^{N-k} x_i\right)^2\right]^{0.5} \cdot \left[\sum_{i=1}^{N-k} (y_{i+k})^2 - \frac{1}{N-k} \cdot \left(\sum_{i=1}^{N-k} y_{i+k}\right)^2\right]^{0.5}}$$

Range of interest for graphs $k := 0 .. K_{lag}$

Results of cross correlation

Results of cross correlation with 95% probability

Data for 01 Jan 2001 to 30 March 2006



Lag in days

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Contribution of rainfall

Not all the rainfall in the lag period contributes equally to the leachate generation on any given day. The following determines the contribution distribution throughout the lag period.

Maximum lag in the regime $K_{lag} = 35$ days

A counter $i := 0..K_{lag}$

Contribution in the lag period (int)
Is the difference between the regression coefficient and the upper bound of the confidence limit.

$$dif(i) := \begin{cases} d \leftarrow r(i, x1, y1, N1) - LC1(i, N1) \\ d \text{ if } d > 0 \\ 0 \text{ otherwise} \end{cases}$$

sum of the differences $Sum_{diff} := \sum_{i=0}^{K_{lag}} dif(i)$ $Sum_{diff} = 3.875$

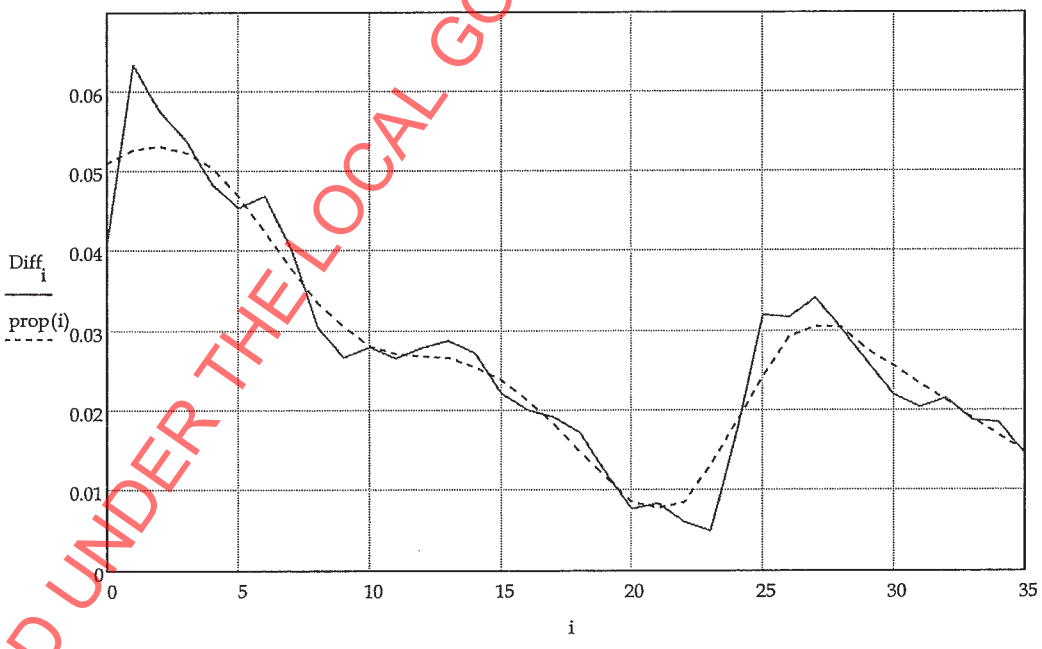
Proportional contribution of rainfall $Diff_i := \frac{dif(i)}{Sum_{diff}}$ $\sum_{i=0}^{K_{lag}} Diff_i = 1$

An array representing the lag day $Day_i := i$

Create a smooth function to describe the function

$p := loess(Day, Diff, 0.4)$

$$prop(d) := \begin{cases} num \leftarrow interp(p, Day, Diff, d) \\ 0 \text{ if } num \le 0 \\ num \text{ otherwise} \end{cases}$$



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02 LANDFILL LEACHATE SIMULATION OPERATING LANDFILL OFF SITE RAINFALL DATA

The contribution of a rainfall event on a particular day provides a response in the leachate collection systems that is dispersed over a number of days that follow. For many landfills, across a wide range of plan areas, this is about four days. The response is not an average across the four days, but has a peak before it diminishes towards the end of the period.

Units

$ha := 10^4 \cdot m^2$

Parameters

Cap type	Area of cap type	Proportion of rainfall that infiltrates cap type
Open active areas	$A_{active} := 1ha$	$Inf_{active} := 100\%$
Short term interim cover	$A_{Stemp} := 6ha$	$Inf_{Stemp} := 13\%$
Long term interim cover	$A_{Ltemp} := 10ha$	$Inf_{Ltemp} := 5\%$
Groundwater catchment	$A_{GW} := 35ha$	$Inf_{GW} := 15\%$
Base flow from waste mass		$Bflow := 0m^3 \cdot day^{-1}$
Groundwater baseflow		$Bflow_{grd} := 250m^3 \cdot day^{-1}$

The lag in the landfill waste and collection system before a rainfall event on a particular day has any measurable effect at the leachate collection system outlet.	There are short cut routes through the waste mass to the collection system and the lag is generally zero days	$lagSys := 0$	days
		$lagSys_{Grd} := 23$	days
The time over which a rainfall event will contribute to the flow in the leachate collection system	Duration of the influence of rainfall event on the leachate flows and groundwater flows are read off the plot produced in Sheet 01 (Stochastic Cross-Correlation)	$DurRain := 20$	days
The time over which a rainfall event on the groundwater catchment will contribute to the flow in the collection system		$DurGrd := 12$	days

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Landfill response characteristic

The following determines the contribution distribution throughout the lagRain period.

Char :=

	0	1
0	0	0.05
1	1	0.05
2	2	0.05
3	3	0.04
4	4	0.03
5	5	0.03
6	6	0.03
7	7	0.03
8	8	0.02
9	9	0.02
10	10	0.01

Not all the rainfall in the period of contribution to collection flows contributes equally to the leachate the collection flow on any given day.

"Char" is modified to match the leachate regime. Enter the values from the Stochastic Cross Correlation sheet to model the shape of the leachate regime.

Total number of daily records

$Nchar := last(Char^{\langle 0 \rangle})$

Nchar = 10 days

Corrected periods for the length of the required characteristic

$$x1 := \frac{Char^{\langle 0 \rangle} \cdot DurRain}{Nchar}$$

Proportion of rainfall contributing in a particular interval

$y1 := Char^{\langle 1 \rangle}$

Function representing the proportion of rainfall allocated to each of the intervals

$p := loess(x1, y1, 0.75)$

Discount the values that are less than zero

$$prop1(d) := \begin{cases} num \leftarrow interp(p, x1, y1, d) \\ 0 \text{ if } num \le 0 \\ num \text{ otherwise} \end{cases}$$

Factor to determine the difference in total rainfall contribution over lagRain

$$Factor := \sum_{i=0}^{DurRain} prop1(i)$$

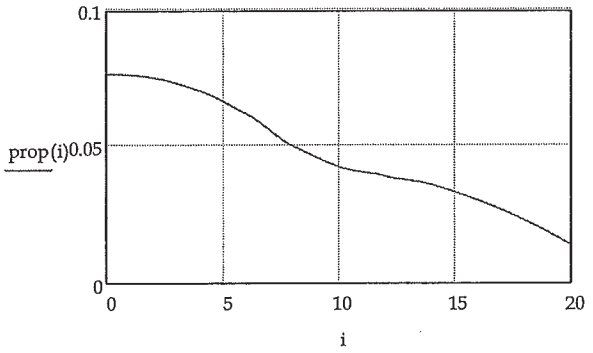
Factor = 0.683

Function for apportioning rainfall contribution on a daily basis

$$prop(d) := \frac{1}{Factor} \cdot prop1(d)$$

Check that the total rainfall contribution sums to unity

$$\sum_{i=0}^{DurRain} prop(i) = 1$$



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Groundwater response characteristic

The following determines the contribution distribution throughout the lagRain period.

$Char_{grd} :=$

	0	1
0	0	0.01
1	1	0.02
2	2	0.03
3	3	0.03
4	4	0.03
5	5	0.02
6	6	0.02
7	7	0.01

Not all the rainfall in the period of contribution to collection flows contributes equally to the groundwater collection flow on any given day.

"Char.grd" is modified to match the groundwater regime. Enter the values from the Stochastic Cross Correlation sheet to model the shape of the groundwater regime.

Total number of daily records

$Nchar_{grd} := last\left(Char_{grd}^{\langle 0 \rangle}\right)$

$Nchar_{grd} = 7$ days

Corrected periods for the length of the required characteristic

$$Gx1 := \frac{Char_{grd}^{\langle 0 \rangle} \cdot DurGrd}{Nchar_{grd}}$$

Proportion of rainfall contributing in a particular interval

$Gy1 := Char_{grd}^{\langle 1 \rangle}$

Function representing the proportion of rainfall allocated to each of the intervals

$Gp := loess(Gx1, Gy1, 0.75)$

Discount the values that are less than zero

$$Gprop1(d) := \begin{cases} num \leftarrow interp(Gp, Gx1, Gy1, d) \\ 0 \text{ if } num \le 0 \\ num \text{ otherwise} \end{cases}$$

Factor to determine the difference in total rainfall contribution over lagRain

$$GFactor := \sum_{i=0}^{DurGrd} Gprop1(i)$$

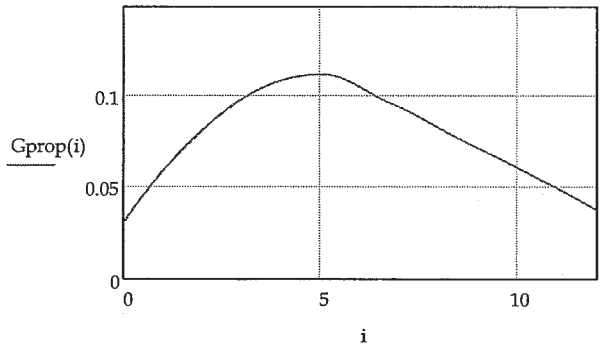
$GFactor = 0.272$

Function for apportioning rainfall contribution on a daily basis

$$Gprop(d) := \frac{1}{GFactor} \cdot Gprop1(d)$$

Check that the total rainfall contribution sums to unity

$$\sum_{i=0}^{DurGrd} Gprop(i) = 1$$



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Leachate collection flow function

Simulated leachate flow rate.

The leachate on an particular day is the sum of the contributions from the rainfalls on all previous days from "lagRain+lagSys" to day "lagSys". The proportion of the each rainfall event is determined by "prop".

The relevant proportion "prop" has to be measured forwards fror d - lagRain to i.

$$Simul(d,R,A,I) := \left| \begin{array}{l} bb \leftarrow \sum_{i=d-(DurRain+lagSys)}^{d-lagSys} \left(R_i \cdot prop(DurRain+i-d)\right) \\ bb \cdot A \cdot I \cdot day^{-1} \end{array} \right.$$

Calculations excludes baseflow which is taken into account below

The relevant proportion "Gprop" has to be measured forwards from d - lagGrd to i

$$GSimul(d,R,A,I) := \left| \begin{array}{l} aa \leftarrow Bflow_{grd} \\ bb \leftarrow \sum_{i=d-(DurGrd+lagSys)}^{d-lagSys} \left(R_i \cdot Gprop(DurGrd+i-d)\right) \\ aa + bb \cdot A \cdot I \cdot day^{-1} \end{array} \right.$$

Leachate collection flow

A long-term prediction of the response of the landfill collection system is derived on the basis of a long-term rainfall pattern.

Silverstream off site record - 01 Jan 2001 to 31 March 2006.

Histrec :=

	0	1
0	0	630.72
1	0	630.72
2	0	630.72
3	0	630.72
4	0	630.72
5	0	630.72
6	0	630.72
7	1	630.72
8	0	630.72
9	0	630.72
10	0	507.17
11	0	507.17
12	0	507.17
13	1	507.17
14	0	507.17
15	1	507.17

Number of records $RecN := last(Histrec^{\langle 0 \rangle})$

$RecN = 1915$

Rainfall $HRain := Histrec^{\langle 0 \rangle} \cdot mm$

Leachate $HLeach := Histrec^{\langle 1 \rangle} \cdot m^3 \cdot day^{-1}$

Counter for leachate $i := (DurRain + lagSys) .. RecN$

Counter for Groundwater $j := (DurGrd + lagSys) .. RecN$

Step for data maximum of lagRain and lagGrd

$Adjust := max(DurRain, DurGrd)$ $Adjust = 20$

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Leachate collection flow simulation

$$Leach_i := \left| \begin{array}{l} a \leftarrow Simul(i, HRain, A_{active}, Inf_{active}) \\ b \leftarrow Simul(i, HRain, A_{Stemp}, Inf_{Stemp}) \\ c \leftarrow Simul(i, HRain, A_{Ltemp}, Inf_{Ltemp}) \\ a + b + c + Bflow \end{array} \right.$$

Groundwater contribution

$$Grdwater_j := GSimul(j, HRain, A_{GW}, Inf_{GW})$$

Disregard data for DurGrd at beginning and end of calculation

$$k := 0 .. last(Grdwater) - Adjust$$

Combined flow

$$TotLeach_k := Leach_{k+Adjust} + Grdwater_{k+Adjust}$$

Historical flow

$$HistLeach_k := HLeach_{k+Adjust}$$

Compare reliable historical flow with simulation

Ignore the first (Dfirst) days

$$D_{first} := 400$$

Ignore the last (Dlast) days

$$D_{last} := 0$$

Total number of records used in the comparison

$$N1 := last(HistLeach) - D_{first} - D_{last} \qquad N1 = 1495$$

Counter for selection of days

$$n := 0 .. N1$$

Flow data

$$RelFlow_n := HistLeach_{n+D_{first}}$$

Sumulation

$$SimFlow_n := TotLeach_{n+D_{first}}$$

Check simulation

$$\frac{\sum SimFlow}{\sum RelFlow} = 1.006$$

	Predicted	***Actual***
Maximum leachate collection	$max(SimFlow) = 2163\,m^3 \cdot day^{-1}$	$max(RelFlow) = 1573\,m^3 \cdot day^{-1}$
Average leachate collection	$mean(SimFlow) = 504\,m^3 \cdot day^{-1}$	$mean(RelFlow) = 501\,m^3 \cdot day^{-1}$

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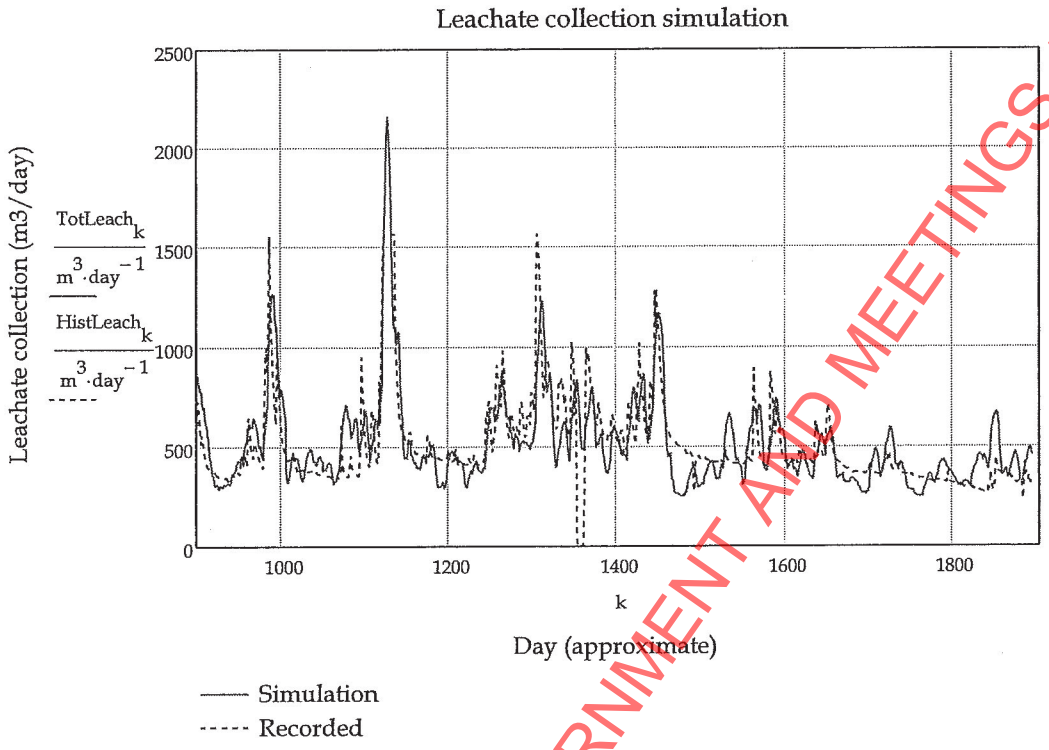

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03 LANDFILL LEACHATE SIMULATION CLOSED LANDFILL OFF SITE RAINFALL DATA

The contribution of a rainfall event on a particular day provides a response in the leachate collection systems that is dispersed over a number of days that follow. For many landfills, across a wide range of plan areas, this is about four days. The response is not an average across the four days, but has a peak before it diminishes towards the end of the period.

Units

$ha := 10^4 \cdot m^2$

Parameters

Cap type	Area of cap type	Proportion of rainfall that infiltrates cap type
Open active areas	$A_{active} := 0ha$	$Inf_{active} := 100\%$
Short term interim cover	$A_{Stemp} := 0ha$	$Inf_{Stemp} := 13\%$
Long term interim cover	$A_{Ltemp} := 7.5ha$	$Inf_{Ltemp} := 5\%$
Groundwater catchment	$A_{GW} := 35ha$	$Inf_{GW} := 15\%$
Base flow from waste mass		$Bflow := 0m^3 \cdot day^{-1}$
Groundwater baseflow		$Bflow_{grd} := 250m^3 \cdot day^{-1}$

The lag in the landfill waste and collection system before a rainfall event on a particular day has any measurable effect at the leachate collection system outlet.	There are short cut routes through the waste mass to the collection system and the lag is generally zero days	$lagSys := 0$	days
		$lagSys_{Grd} := 23$	days
The time over which a rainfall event will contribute to the flow in the leachate collection system	Duration of the influence of rainfall event on the leachate flows and groundwater flows are read off the plot produced in Sheet 01 (Stochastic Cross-Correlation)	$DurRain := 20$	days
The time over which a rainfall event on the groundwater catchment will contribute to the flow in the collection system		$DurGrd := 12$	days

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Landfill response characteristic

The following determines the contribution distribution throughout the lagRain period.

Char :=

	0	1
0	0	0.05
1	1	0.05
2	2	0.05
3	3	0.04
4	4	0.03
5	5	0.03
6	6	0.03
7	7	0.03
8	8	0.02
9	9	0.02
10	10	0.01

Not all the rainfall in the period of contribution to collection flows contributes equally to the leachate the collection flow on any given day.

"Char" is modified to match the leachate regime. Enter the values from the Stochastic Cross Correlation sheet to model the shape of the leachate regime.

Total number of daily records

$Nchar := last(Char^{\langle 0 \rangle})$

Nchar = 10 days

Corrected periods for the length of the required characteristic

$$x1 := \frac{Char^{\langle 0 \rangle} \cdot DurRain}{Nchar}$$

Proportion of rainfall contributing in a particular interval

$y1 := Char^{\langle 1 \rangle}$

Function representing the proportion of rainfall allocated to each of the intervals

$p := loess(x1, y1, 0.75)$

Discount the values that are less than zero

$$prop1(d) := \begin{cases} num \leftarrow interp(p, x1, y1, d) \\ 0 \text{ if } num \le 0 \\ num \text{ otherwise} \end{cases}$$

Factor to determine the difference in total rainfall contribution over lagRain

$$Factor := \sum_{i=0}^{DurRain} prop1(i)$$

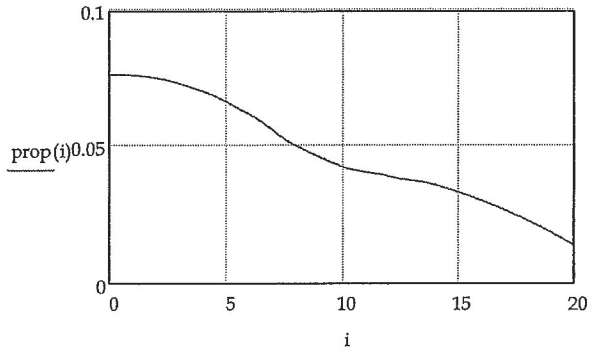
Factor = 0.683

Function for apportioning rainfall contribution on a daily basis

$$prop(d) := \frac{1}{Factor} \cdot prop1(d)$$

Check that the total rainfall contribution sums to unity

$$\sum_{i=0}^{DurRain} prop(i) = 1$$



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Groundwater response characteristic

The following determines the contribution distribution throughout the lagRain period.

$Char_{grd} :=$

	0	1
0	0	0.01
1	1	0.02
2	2	0.03
3	3	0.03
4	4	0.03
5	5	0.02
6	6	0.02
7	7	0.01

Not all the rainfall in the period of contribution to collection flows contributes equally to the groundwater collection flow on any given day.

"Char.grd" is modified to match the groundwater regime. Enter the values from the Stochastic Cross Correlation sheet to model the shape of the groundwater regime.

Total number of daily records

$Nchar_{grd} := last(Char_{grd}^{\langle 0 \rangle})$

$Nchar_{grd} = 7$ days

Corrected periods for the length of the required characteristic

$$Gx1 := \frac{Char_{grd}^{\langle 0 \rangle} \cdot DurGrd}{Nchar_{grd}}$$

Proportion of rainfall contributing in a particular interval

$Gy1 := Char_{grd}^{\langle 1 \rangle}$

Function representing the proportion of rainfall allocated to each of the intervals

$Gp := loess(Gx1, Gy1, 0.75)$

Discount the values that are less than zero

$$Gprop1(d) := \begin{cases} num \leftarrow interp(Gp, Gx1, Gy1, d) \\ 0 \text{ if } num \le 0 \\ num \text{ otherwise} \end{cases}$$

Factor to determine the difference in total rainfall contribution over lagRain

$$GFactor := \sum_{i=0}^{DurGrd} Gprop1(i)$$

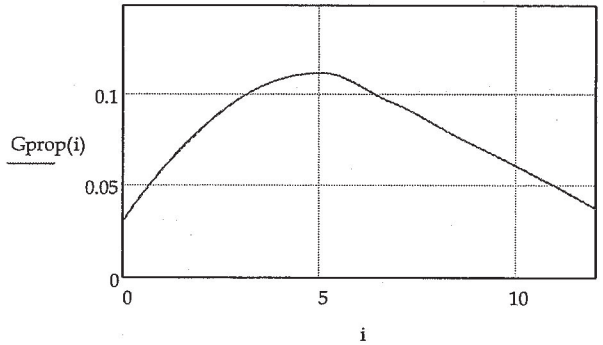
$GFactor = 0.272$

Function for apportioning rainfall contribution on a daily basis

$$Gprop(d) := \frac{1}{GFactor} \cdot Gprop1(d)$$

Check that the total rainfall contribution sums to unity

$$\sum_{i=0}^{DurGrd} Gprop(i) = 1$$



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Leachate collection flow function

Simulated leachate flow rate.

The leachate on an particular day is the sum of the contributions from the rainfalls on all previous days from "lagRain+lagSys" to day "lagSys". The proportion of the each rainfall event is determined by "prop".

The relevant proportion "prop" has to be measured forwards fror d - lagRain to i.

$$Simul(d,R,A,I) := \left| \begin{array}{l} bb \leftarrow \sum_{i=d-(DurRain+lagSys)}^{d-lagSys} \left(R_i \cdot prop(DurRain + i - d)\right) \\ bb \cdot A \cdot I \cdot day^{-1} \end{array} \right.$$

Calculations excludes baseflow which is taken into account below

The relevant proportion "Gprop" has to be measured forwards from d - lagGrd to i

$$GSimul(d,R,A,I) := \left| \begin{array}{l} aa \leftarrow Bflow_{grd} \\ bb \leftarrow \sum_{i=d-(DurGrd+lagSys)}^{d-lagSys} \left(R_i \cdot Gprop(DurGrd + i - d)\right) \\ aa + bb \cdot A \cdot I \cdot day^{-1} \end{array} \right.$$

Leachate collection flow

A long-term prediction of the response of the landfill collection system is derived on the basis of a long-term rainfall pattern.

Silverstream off site record - 01 Jan 2001 to 31 March 2006.

Histrec :=

	0	1
0	0	630.72
1	0	630.72
2	0	630.72
3	0	630.72
4	0	630.72
5	0	630.72
6	0	630.72
7	1	630.72
8	0	630.72
9	0	630.72
10	0	507.17
11	0	507.17
12	0	507.17
13	1	507.17
14	0	507.17
15	1	507.17

Number of records $RecN := last\left(Histrec^{\langle 0 \rangle}\right)$

$RecN = 1915$

Rainfall $HRain := Histrec^{\langle 0 \rangle} \cdot mm$

Leachate $HLeach := Histrec^{\langle 1 \rangle} \cdot m^3 \cdot day^{-1}$

Counter for leachate $i := (DurRain + lagSys) .. RecN$

Counter for Groundwater $j := (DurGrd + lagSys) .. RecN$

Step for data maximum of lagRain and lagGrd

$Adjust := \max(DurRain, DurGrd)$ $Adjust = 20$

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Leachate collection flow simulation

$$Leach_i := \begin{| a \leftarrow Simul(i, HRain, A_{active}, Inf_{active}) \\ b \leftarrow Simul(i, HRain, A_{Stemp}, Inf_{Stemp}) \\ c \leftarrow Simul(i, HRain, A_{Ltemp}, Inf_{Ltemp}) \\ a + b + c + Bflow \end{|}$$

Groundwater contribution

$$Grdwater_j := GSimul(j, HRain, A_{GW}, Inf_{GW})$$

Disregard data for DurGrd at beginning and end of calculation

$$k := 0.. last(Grdwater) - Adjust$$

Combined flow

$$TotLeach_k := Leach_{k+Adjust} + Grdwater_{k+Adjust}$$

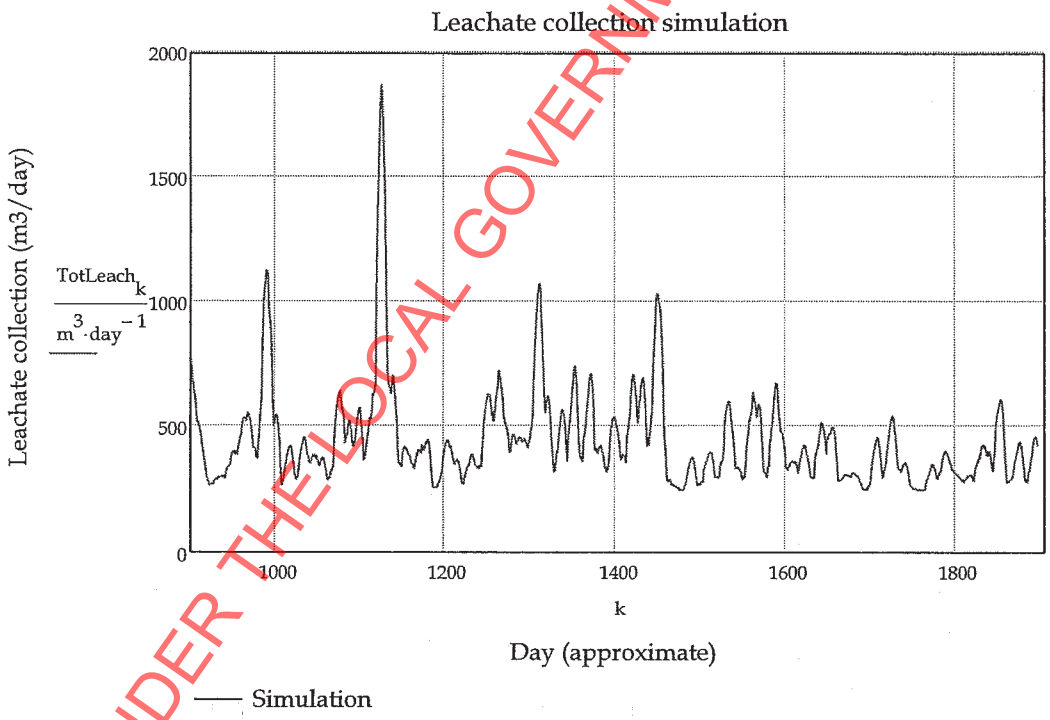
Predicted

Maximum leachate collection

$$max(TotLeach) = 1875\,m^3 \cdot day^{-1}$$

Average leachate collection

$$mean(TotLeach) = 432\,m^3 \cdot day^{-1}$$



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Appendix C: Stage 1/1A leachate bypass design calculations

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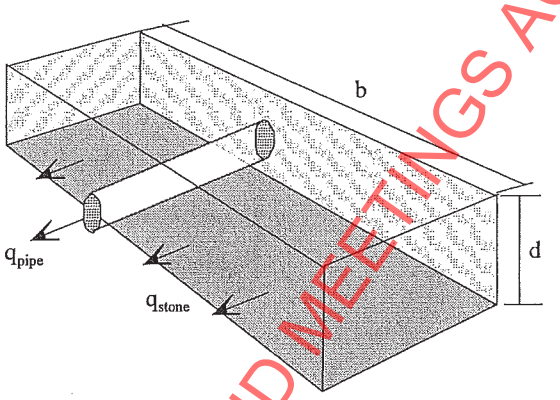
01 UPPER LEVEL STAGE 1 LEACHATE DRAINAGE CAPACITY

The upper level Stage 1 leachate pipe is designed to drain the leachate from Stage 1/1A in the event that leachate is building up above the lower level bypass drain. The upper level pipe has been designed to take the whole Stage 1/1A leachate design flow, assuming complete redundancy of the lower level pipe.

The capacity of the pipe is estimated using the Colebrook-White equation.



Units

$$litre := 10^{-3}\,m^3$$

Parameters

Leachate header

Adopt the longterm condition of the pipe, it is likely to become slimed over the years of service.

Roughness coefficient in mm (slimed perforated HDPE pipe) $k_s := 0.3mm$

Temperature of leachate $t := 20\ ^{o}C$

Design leachate flow capacity

Estimated leachate flow $Q_{Leach} := 30 \cdot litre \cdot s^{-1}$

$Q_{Leach} = 2592\,m^3\,day^{-1}$

$FoS_{Leach} := 1.5$

Design leachate flow $Q_{LeachDes} := Q_{Leach} \cdot FoS_{Leach}$ $Q_{LeachDes} = 45\,litre \cdot s^{-1}$

Equations

Flow rate in leachate drainage pipes

Function for pipe full flow $q_{pipe}(x, D) :=$

$v \leftarrow \frac{40 \cdot 10^{-6} \cdot m^2 \cdot s^{-1}}{20 + t}$

Wetted Area $A \leftarrow \frac{\pi \cdot D^2}{4}$

Wetted Perimeter $P \leftarrow D \cdot \pi$

Hydraulic radius $R \leftarrow \frac{A}{P}$

Colebrook-White equation $v \leftarrow -\left(\sqrt{32 \cdot g \cdot R \cdot \frac{1}{x}} \cdot \log\left(\frac{k_s}{14.8 \cdot R} + \frac{1.255 \cdot v}{R \cdot \sqrt{32 \cdot g \cdot R \cdot \frac{1}{x}}}\right)\right)$

$A \cdot v$

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Results - UPPER LEVEL LEACHATE DRAIN

200mm PIPE

Slope of drainage pipe (1:X) $X_1 := 20$

Diameter of header $Dia_{Leach} := 0.250m$

Capacity of leachate pipe $q_{pipeLeach} := q_{pipe}(X_1, Dia_{Leach})$ $q_{pipeLeach} = 168\,litre\,s^{-1}$

Check1 := "Insufficient capacity in leachate pipe" if $q_{pipeLeach} < Q_{LeachDes}$
"Sufficient capacity in leachate pipe" otherwise

Check1 = "Sufficient capacity in leachate pipe"

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02 HORIZONTAL PIPE STRENGTH

Suitable for use in the design of horizontal pipes buried at depth without particular support to the pipe structure. Generally used for the design of horizontal drainage pipes in HDPE.

Design approach:

- Calculate the external pressure on the pipe, this includes long-term loading and short term loading.
- Factor the external pressure to account for the difference between the perforated pipe surface and a solid wall pipe.
- Determine the factor of safety for wall crushing.
- Determine the Modulus of Elasticity for pipe material at the anticipated design life of the pipe taking account of the effects of compressive stress and temperature.
- Determine the factor of safety for wall buckling.
- Determine the factor of safety for wall deflection.

Parameters

Unit weight of soil (waste)		$\gamma_s := 14.0\,kN\cdot m^{-3}$
Maximum depth of soil		$d := 80m$
Soil Modulus (of surrounding material - crushed rock)		$E' := 100MPa$
Pipe SDR (standard dimension ratio)		$SDR := 11$
Compressive yield strength of pipe (Driscopipe 1500 psi)	$\sigma_a := 1500psi$	$\sigma_a = 10.342\,MPa$
Leachate temperature		$L_{temp} := 20$ °C
Pipe internal pressure (vacuum is negative) Leachate pipes operate at normal atmospheric pressure		$\Delta P_{int} := 0MPa$

Pressure on pipe

For deep burial the form of equations developed for incomplete projection should be used to determine the overburden pressure. This allows for the arching effect of materials across the pipe diameter.

Overburden pressure	$P_{oNIP} := d\cdot\gamma_s$	$P_{oNIP} = 1120\,kPa$
Based upon incomplete projection (refer to separate calculations)	From sheet 03	$P_{oIP} := 475kPa$
Total applied pressure	$P(P_o) := P_o - \Delta P_{int}$	$P(P_{oNIP}) = 1120\,kPa$ $P(P_{oIP}) = 475\,kPa$

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Wall crushing

Wall crushing theoretically occurs when the stress in a pipe wall, due to external vertical pressure, exceeds the long-term compressive strength of the pipe material. To ensure that the pipe wall is strong enough to endure the external pressure:

Compressive stress in pipe

$$\sigma_c(P) := \frac{SDR - 1}{2} \cdot P$$

$\sigma_c(P(P_{oNIP})) = 5.6\,MPa$

$\sigma_c(P(P_{oIP})) = 2.375\,MPa$

Soil strain

$$\varepsilon_s(P) := \frac{P}{E'}$$

$\varepsilon_s(P(P_{oNIP})) = 0.011$

$\varepsilon_s(P(P_{oIP})) = 4.75 \times 10^{-3}$

Factor of safety against wall crushing

$$FoS_{wc}(P) := \frac{\sigma_a}{\sigma_c(P)}$$

$FoS_{wc}(P(P_{oNIP})) = 1.847$

$FoS_{wc}(P(P_{oIP})) = 4.355$

Most manufactures consider that a factor of safety of 1 is sufficient

$$Check1 := \begin{cases} \text{"Crushing FoS OK"} & \text{if } FoS_{wc}(P(P_{oNIP})) \geq 1 \\ \text{"Crushing not OK"} & \text{otherwise} \end{cases}$$

$$Check2 := \begin{cases} \text{"Crushing FoS OK"} & \text{if } FoS_{wc}(P(P_{oIP})) \geq 1 \\ \text{"Crushing not OK"} & \text{otherwise} \end{cases}$$

Without taking into account incomplete projection

$Check1 = \text{"Crushing FoS OK"}$

Taking into account incomplete projection

$Check2 = \text{"Crushing FoS OK"}$

Modulus of Elasticity for pipe

Instantaneous modulus of elasticity at reference temperature of 23°C

$E_{I23} := EI(23)$

$E_{I23} = 901.8\,MPa$

Instantaneous modulus of elasticity at temperature of leachate

$E_{Itemp} := EI(L_{temp})$

$E_{Itemp} = 952.5\,MPa$

Design life 50 years

Elasticity to allow for compressive stress in pipe

$E_{stress}(p) := E50(\sigma_c(p))$

$E_{stress}(P(P_{oNIP})) = 88\,MPa$

$E_{stress}(P(P_{oIP})) = 160\,MPa$

Modulus of elasticity corrected for environmental conditions

$$E_{penv}(P) := E_{stress}(P) \cdot \frac{E_{Itemp}}{E_{I23}}$$

$E_{penv}(P(P_{oNIP})) = 93\,MPa$

$E_{penv}(P(P_{oIP})) = 169\,MPa$

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Wall buckling

Local wall buckling is a longitudinal wrinkling of the pipe wall. tests of non-pressurised Driscopipe show that buckling and collapse do not occur where the soil envelope is in full contact with the pipe and is compacted to a dense state.

However, it can be forced to occur over the long-term in non-pressurised pipe if the total external soil pressure P_t is allowed to exceed the pipe-soil system's critical buckling pressure P_{cb}. If $P_t > P_{cb}$ gradual collapse may occur over the long term. A calculated, conservative value for the critical buckling pressure may be obtained by the following approximate formula. All pipe diameters with the same SDR in the same burial condition have the same critical collapse and critical buckling endurance.

Critical collapse differential pressure

$$P_c(P) := \frac{2.32 \cdot E_{penv}(P)}{SDR^3}$$

$P_c(P(P_{oNIP})) = 162\,kPa$

$P_c(P(P_{oIP})) = 295\,kPa$

Critical Buckling pressure

$$P_{cb}(P) := 0.8 \cdot \sqrt{E' \cdot P_c(P)}$$

$P_{cb}(P(P_{oNIP})) = 3\,MPa$

$P_{cb}(P(P_{oIP})) = 4\,MPa$

Factor of safety against wall buckling

$$FoS_{wb}(P) := \frac{P_{cb}(P)}{P}$$

$FoS_{wb}(P(P_{oNIP})) = 2.871$

$FoS_{wb}(P(P_{oIP})) = 9.149$

A minimum acceptable factor of safety of 1 is considered to be acceptable because of the conservativeness in the method

$$Check3 := \begin{cases} \text{"Buckling OK"} & \text{if } FoS_{wb}(P(P_{oNIP})) \geq 1 \\ \text{"Buckling not OK"} & \text{otherwise} \end{cases}$$

$$Check4 := \begin{cases} \text{"Buckling OK"} & \text{if } FoS_{wb}(P(P_{oIP})) \geq 1 \\ \text{"Buckling not OK"} & \text{otherwise} \end{cases}$$

Without taking into account incomplete projection

$Check3 = \text{"Buckling OK"}$

Taking into account incomplete projection

$Check4 = \text{"Buckling OK"}$

Ring deflection

Ring deflection is defined as the ratio of the vertical change in diameter to the original diameter. It is often expressed as a percentage.

Ring deflection for buried HDPE pipe is conservatively assumed to be the same as the vertical compression of the soil envelope around the pipe. Design by ring deflection matches the ability of the HDPE pipe to accommodate, without structural distress, the vertical compression of the soil enveloping the buried pipe.

The allowable ring deflection of HDPE pipe is a function of the allowable tangential strain in the outer surface of the pipe wall.

A limit of 1% to 1.5% tangential strain in the outer surface of the pipe wall due to vertical deflection of the pipe by soil compression is generally assumed to be conservatively accepted by most HDPE pipe manufactures. The allowable vertical strain (ring deflection) of the pipe of 2% to 8% does not result in a significant loss of cross sectional area or flow capacity of the pipe, since the deformed pipe has a larger horizontal dimension than that of the original pipe, which compensates for the loss of the vertical

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dimension.

Therefore a factor of safety of 1 for ring deflection is generally considered to be acceptable.

Vertical strain in the soil envelope

$\varepsilon_s(P(P_{oNIP})) = 1.12\ \%$

$\varepsilon_s(P(P_{oIP})) = 0.48\ \%$

Tangential strain in the outer surface of the pipe

$\varepsilon_t(P) := \frac{\varepsilon_s(P)}{0.25 \cdot SDR}$

$\varepsilon_t(P(P_{oNIP})) = 0.41\ \%$

$\varepsilon_t(P(P_{oIP})) = 0.17\ \%$

Allowable vertical strain in the pipe (SDR 11)

$\varepsilon_{pallow} := 2.7\%$

Factor of safety on ring deflection

$FoS_{rd}(P) := \frac{\varepsilon_{pallow}}{\varepsilon_s(P)}$

$FoS_{rd}(P(P_{oNIP})) = 2.411$

$FoS_{rd}(P(P_{oIP})) = 5.684$

$Check5 := \begin{cases} \text{"Ring deflection OK"} & \text{if } FoS_{rd}(P(P_{oNIP})) \geq 1 \\ \text{"Ring deflection not OK"} & \text{otherwise} \end{cases}$

$Check6 := \begin{cases} \text{"Ring deflection OK"} & \text{if } FoS_{rd}(P(P_{oIP})) \geq 1 \\ \text{"Ring deflection not OK"} & \text{otherwise} \end{cases}$

Without taking into account incomplete projection

Check5 = "Ring deflection OK"

Taking into account incomplete projection

Check6 = "Ring deflection OK"

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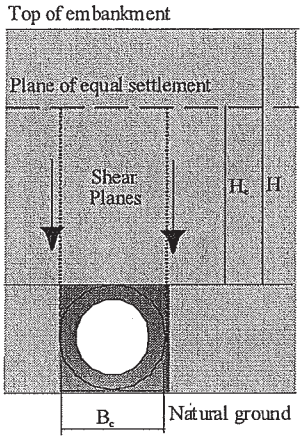
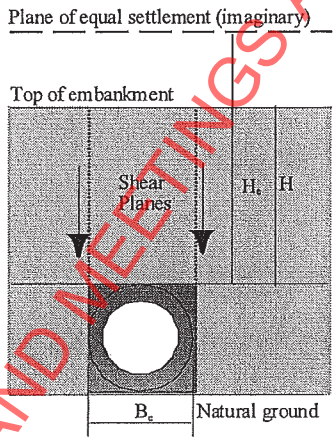
03 POSITIVE PROJECTION CONDITION (EMBANKMENT OR WIDE TRENCH) - LOAD ON PIPE

The pipe material is generally much stiffer than the fill beside it. Therefore, frictional forces from downdrag at the sides add to the pipe load. When H is relatively small the frictional slip planes are assumed to extend to the surface and this is termed "complete projection".

When H is large, the vertical slip planes are considered to peter out at a level known as the "plane of equal settlement" situated a height H_e. This situation is termed the "incomplete projection" condition.



Incomplete projection condition



Complete projection condition

Reference

TRRL 1983 "A guide to design loadings for buried pipes"

Parameters

Unit weight of backfill (rockfill and waste) $\gamma := \frac{0.5 \cdot 20 + 79.5 \cdot 14}{80} kN \cdot m^{-3}$ $\gamma = 14.0\,kN \cdot m^{-3}$

Back fill soil characteristics: The parameter Kμ is a semi-empirical constant which is a combination of :

- K the Active earth pressure coefficient; and
- μ the coeffciient of sliding friction within a mass of fill

The maximum value is generally adopted because this gives the worst case.

Descritpion of backfill	Ku	
Granular materials without cohesion	0.19	
Sand and gravel	0.165	max
Saturated top soil	0.15	max
Clay	0.13	ordinary max
Saturated clay	0.11	max

$K\mu := 0.19$

The settlement ratio is regarded as a semi-empirical constant and is a function of the pipe installation. Although theoretically negative values of r_{sd} can occur they are unlikely.

Foundation condition	rsd	
	min	max
Pipe laid on unyeilding foundation (eg rock)	1	1
Pipe laid on normal foundation	0.5	0.8
Pipe laid ion yeilding foundation	0	0.5

$r_{sd} := 1$

Positive projection ratio is that proportion of the pipe's external diameter that is a above the firm bedding level or natural ground. $p := 1$

Pipe outside diameter 250 OD SDR11 HDPE pipe $B_c := 250mm$

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Ranges

Minimum depth of cover $H_{min} := 1m$

Maximum depth of cover $H_{max} := 100m$

Complete projection

Load on pipe

$$W_{c_Comp}(H) := \frac{e^{2\cdot\left(K\mu\cdot\frac{H}{B_c}\right)} - 1}{2\cdot K\mu}\cdot\gamma\cdot B_c^{\,2}$$

Transition depth

Function to find transition depth:

$$fHe(H_e, H) := \left| \begin{array}{l} aa \leftarrow \frac{e^{2\cdot K\mu\cdot\frac{H_e}{B_c}} - 1}{2\cdot K\mu}\cdot\left[\frac{1}{2\cdot K\mu} + \left(\frac{H}{B_c} - \frac{H_e}{B_c}\right) + \frac{r_{sd}\cdot p}{3}\right] \\ bb \leftarrow \frac{1}{2}\cdot\left(\frac{H_e}{B_c}\right)^2 \\ cc \leftarrow \frac{r_{sd}\cdot p}{3}\cdot\left(\frac{H}{B_c} - \frac{H_e}{B_c}\right)\cdot e^{2\cdot K\mu\cdot\frac{H_e}{B_c}} \\ dd \leftarrow \frac{H_e}{2\cdot K\mu\cdot B_c} \\ ee \leftarrow \frac{H\cdot H_e}{B_c^{\,2}} \\ ff \leftarrow r_{sd}\cdot p\cdot\frac{H}{B_c} \\ aa + bb + cc - dd - ee - ff \end{array} \right.$$

Transition depth

$$H_e(H) := \left| \begin{array}{l} he \leftarrow 0.1m \\ s \leftarrow root(fHe(he, H), he) \end{array} \right.$$

Incomplete projection

Load on pipe as a function Spangler's formula

$$W_{c_Incomp}(H) := \left| \begin{array}{l} h_e \leftarrow H_e(H) \\ \left[\frac{e^{2\cdot K\mu\cdot\frac{h_e}{B_c}} - 1}{2\cdot K\mu} + \left(\frac{H}{B_c} - \frac{h_e}{B_c}\right)\cdot e^{2\cdot K\mu\cdot\frac{h_e}{B_c}}\right]\cdot\gamma\cdot B_c^{\,2} \end{array} \right.$$

Combined Formulation

When H is greater than He, the situation is termed the incomplete projection condition.

$$W_c(H) := \left| \begin{array}{l} h_e \leftarrow H_e(H) \\ W_{c_Comp}(H) \quad \text{if } H < h_e \\ W_{c_Incomp}(H) \quad \text{otherwise} \end{array} \right.$$

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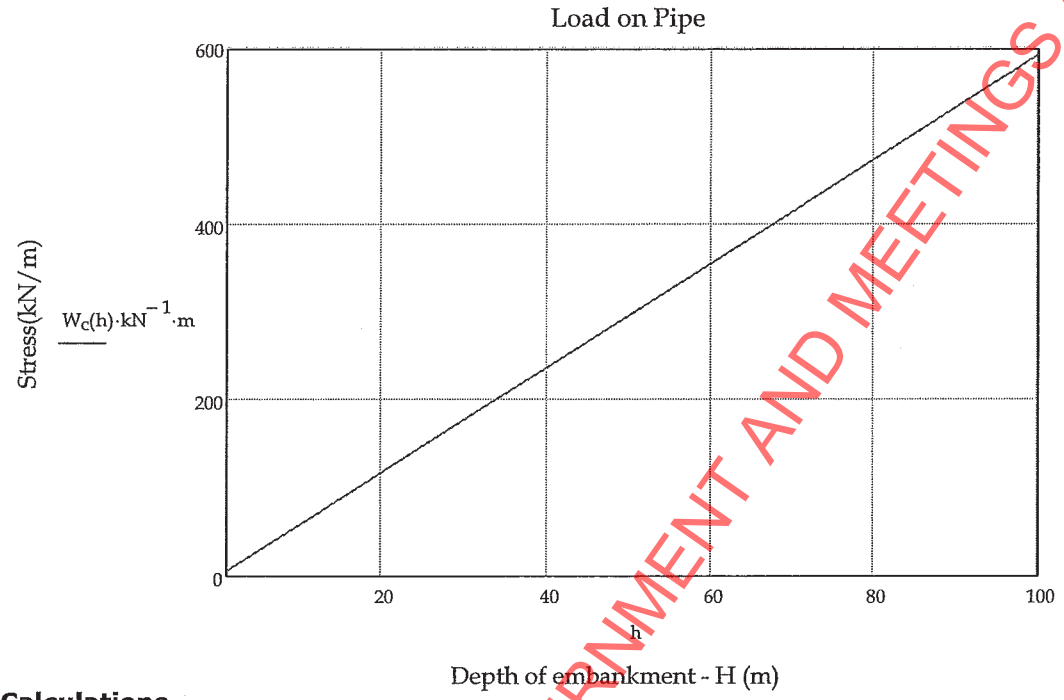
Results



Calculations

Depth h (m)	Transition depth H_e (m)	Stress on pipe (kN/m)
$h_1 := 5m$	$H_e(h_1) = 0.354\,m$	$W_c(h_1) = 29.581\,kN\cdot m^{-1}$
$h_2 := 80m$	$H_e(h_2) = 0.346\,m$	$W_c(h_2) = 474.7\,kN\cdot m^{-1}$

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Appendix D: Liner design calculations

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01a LINER LEAKAGE THROUGH COMPOSITE LINERS DUE TO GEOMEMBRANE DEFECTS - TYPE A, BASE

References

Giroud JP, Soderman KL, Khire MV & Badu-Tweneboah K "New Developemts in Landfill LIner Leakage Evaluation" Proceedings of GeoEnvironment, Atlanta, USA, 1998

Units

$ha := 10000m^2$

Theory

In the context of this paper:

1. A composite liner consists of a synthetic component (a geomembrane) and a mineral component (a low permeability soil or a GCL)
2. The mineral content (low permeability medium) is located beneath the geomembrane.

For a circular or quasi circular defect the leakage rate through a composite liner is given as:

$$Q = C_{90} \cdot \left[1 + 0.1 \cdot \left(\frac{h}{t_{um}}\right)^{0.95}\right] \cdot a^{0.1} \cdot h^{0.9} \cdot k_{um}^{0.74}$$

Where

Q = leakage rate (m^3/s)

C_{90} = dimensionless coefficient that characterises the quality of contact between the geomembrane and the underlying medium

h = leachate head on top of the liner (m)

t_{um} = thickness of the low permeability medium underlying the geomembrane (m)

a = defect area (m^2)

k_{um} = permeability of the low permeability medium underlying the geomembrane (m/s)

Two typical values of C_{90} are considered:

$C_{90good} := 0.21$

$C_{90poor} := 1.15$

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The limits of the equation are as follows:

1. If a defect is circular, the defect diameter should not be less than 0.5 mm and not greater than 25 mm
2. The liquid head on top of the geomembrane should be equal to or less than 3 m
3. The hydraulic conductivity of the low permeability medium underlying the geomebrane, k_{um} should be equal to or less than k_G, where k_G is given by the following equation when the geomembrane defect is circular:

$$k_G = \left[\frac{0.3891 d^{1.8}}{C_{90} \cdot \left[1 + 0.1 \cdot \left(\frac{h}{t_{um}} \right)^{0.95} \right] \cdot h^{0.4}} \right]^{\frac{1}{0.74}}$$

Frequency and size of defects is recommended by Giroud and Bonapart (1989) as:

Installation Defects		
width - recommended high	5	mm
length - recommended high	20	mm
Defects density - intensively monitored installation	1	Defects/acre
Defects density - spot checks	10	Defects/acre
Giroud and Bonapart (1989)		

Parameters

Leachate head on top of the liner (m)		$h := 0.3m$
Thickness of the low permeability medium underlying the geomembrane (m)		$t_{um} := 600mm$
Defect area (m^2)	$a := 5mm \cdot 20mm$	$a = 1 \times 10^{-4} m^2$
Number of defects (assume good QA/QC)	$n := 1 \cdot acre^{-1}$	$n = 2.471 ha^{-1}$
Permeability of the low permeability medium underlying the geomembrane (m/s)		$k_{um} := 1 \cdot 10^{-9} m \cdot s^{-1}$

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Calculations

Check applicability of equation

Equivalent defect diameter (m)
(if defect assumed to be circular)

$$d := \left(\frac{a \cdot 4}{\pi}\right)^{0.5} \qquad d = 1.128 \times 10^{-2}\,m$$

$$k_G(C_{90}) := \left[\frac{0.3891\left(\frac{d}{m}\right)^{1.8}}{C_{90}\cdot\left[1 + 0.1\cdot\left(\frac{\frac{h}{m}}{\frac{t_{um}}{m}}\right)^{0.95}\right]\cdot\left(\frac{h}{m}\right)^{0.4}}\right]^{\frac{1}{0.74}}\cdot m\cdot s^{-1}$$

$$Check_{poor} := \begin{cases} \text{"Equation not valid"} & \text{if } k_{um} > k_G(C_{90poor}) \\ \text{"Equation valid"} & \text{otherwise} \end{cases}$$

$$Check_{poor} = \text{"Equation valid"}$$

$$Check_{good} := \begin{cases} \text{"Equation not valid"} & \text{if } k_{um} > k_G(C_{90good}) \\ \text{"Equation valid"} & \text{otherwise} \end{cases}$$

$$Check_{good} = \text{"Equation valid"}$$

Calculate seepage rate per defect

$$Q(C_{90}) := \left[C_{90}\cdot\left[1 + 0.1\cdot\left(\frac{\frac{h}{m}}{\frac{t_{um}}{m}}\right)^{0.95}\right]\cdot\left(\frac{a}{m^2}\right)^{0.1}\cdot\left(\frac{h}{m}\right)^{0.9}\cdot\left(\frac{k_{um}}{m\cdot s^{-1}}\right)^{0.74}\right]\cdot m^3\cdot s^{-1}$$

$$Q(C_{90poor}) = 3.565 \times 10^{-8}\,m^3\cdot s^{-1}$$

$$Q(C_{90good}) = 6.509 \times 10^{-9}\,m^3\cdot s^{-1}$$

Calculate total seepage per hectare per year

$$Q_{poor} := Q(C_{90poor})\cdot n$$

$$Q_{poor} = 2.78\,m^3\cdot ha^{-1}\cdot yr^{-1}$$

$$Q_{good} := Q(C_{90good})\cdot n$$

$$Q_{good} = 0.51\,m^3\cdot ha^{-1}\cdot yr^{-1}$$

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01b LINER LEAKAGE THROUGH COMPOSITE LINERS DUE TO GEOMEMBRANE DEFECTS - TYPE B SLOPES

References

Giroud JP, Soderman KL, Khire MV & Badu-Tweneboah K "New Developemts in Landfill LIner Leakage Evaluation" Proceedings of GeoEnvironment, Atlanta, USA, 1998

Units

$ha := 10000m^2$

Theory

In the context of this paper:

1. A composite liner consists of a synthetic component (a geomembrane) and a mineral component (a low permeability soil or a GCL)
2. The mineral content (low permeability medium) is located beneath the geomembrane.

For a circular or quasi circular defect the leakage rate through a composite liner is given as:

$$Q = C_{90} \cdot \left[1 + 0.1 \cdot \left(\frac{h}{t_{um}}\right)^{0.95}\right] \cdot a^{0.1} \cdot h^{0.9} \cdot k_{um}^{0.74}$$

Where

Q = leakage rate (m^3/s)

C_{90} = dimensionless coefficient that characterises the quality of contact between the geomembrane and the underlying medium

h = leachate head on top of the liner (m)

t_{um} = thickness of the low permeability medium underlying the geomembrane (m)

a = defect area (m^2)

k_{um} = permeability of the low permeability medium underlying the geomembrane (m/s)

Two typical values of C_{90} are considered:

$C_{90good} := 0.21$

$C_{90poor} := 1.15$

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The limits of the equation are as follows:

1. If a defect is circular, the defect diameter should not be less than 0.5 mm and not greater than 25 mm
2. The liquid head on top of the geomembrane should be equal to or less than 3 m
3. The hydraulic conductivity of the low permeability medium underlying the geomebrane, k_{um} should be equal to or less than k_G, where k_G is given by the following equation when the geomembrane defect is circular:

$$k_G = \left[\frac{0.3891 d^{1.8}}{C_{90} \cdot \left[1 + 0.1 \cdot \left(\frac{h}{t_{um}} \right)^{0.95} \right] \cdot h^{0.4}} \right]^{\frac{1}{0.74}}$$

Frequency and size of defects is recommended by Giroud and Bonapart (1989) as:

Installation Defects		
width - recommended high	5	mm
length - recommended high	20	mm
Defects density - intensively monitored installation	1	Defects/acre
Defects density - spot checks	10	Defects/acre
Giroud and Bonapart (1989)		

Parameters

Leachate head on top of the liner (m)		$h := 0.3m$
Thickness of the low permeability medium underlying the geomembrane (m)		$t_{um} := 600mm$
Defect area (m^2)	$a := 5mm \cdot 20mm$	$a = 1 \times 10^{-4} m^2$
Number of defects (assume good QA/QC)	$n := 1 \cdot acre^{-1}$	$n = 2.471 ha^{-1}$
Permeability of the low permeability medium underlying the geomembrane (m/s)	Type 1B soil liner	$k_{um} := 1 \cdot 10^{-7} m \cdot s^{-1}$

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Calculations

Check applicability of equation

Equivalent defect diameter (m)
(if defect assumed to be circular)

$$d := \left(\frac{a \cdot 4}{\pi}\right)^{0.5} \qquad d = 1.128 \times 10^{-2}\,m$$

$$k_G(C_{90}) := \left[\frac{0.3891\left(\frac{d}{m}\right)^{1.8}}{C_{90}\cdot\left[1 + 0.1\cdot\left(\frac{\frac{h}{m}}{\frac{t_{um}}{m}}\right)^{0.95}\right]\cdot\left(\frac{h}{m}\right)^{0.4}}\right]^{\frac{1}{0.74}} \cdot m \cdot s^{-1}$$

$$Check_{poor} := \begin{cases} \text{"Equation not valid"} & \text{if } k_{um} > k_G(C_{90poor}) \\ \text{"Equation valid"} & \text{otherwise} \end{cases}$$

$$Check_{poor} = \text{"Equation valid"}$$

$$Check_{good} := \begin{cases} \text{"Equation not valid"} & \text{if } k_{um} > k_G(C_{90good}) \\ \text{"Equation valid"} & \text{otherwise} \end{cases}$$

$$Check_{good} = \text{"Equation valid"}$$

Calculate seepage rate per defect

$$Q(C_{90}) := \left[C_{90}\cdot\left[1 + 0.1\left(\frac{\frac{h}{m}}{\frac{t_{um}}{m}}\right)^{0.95}\right]\cdot\left(\frac{a}{m^2}\right)^{0.1}\cdot\left(\frac{h}{m}\right)^{0.9}\cdot\left(\frac{k_{um}}{m\cdot s^{-1}}\right)^{0.74}\right]\cdot m^3\cdot s^{-1}$$

$$Q(C_{90poor}) = 1.077 \times 10^{-6}\,m^3\cdot s^{-1}$$

$$Q(C_{90good}) = 1.966 \times 10^{-7}\,m^3\cdot s^{-1}$$

Calculate total seepage per hectare per year

$$Q_{poor} := Q(C_{90poor})\cdot n$$

$$Q_{poor} = 83.95\,m^3\cdot ha^{-1}\cdot yr^{-1}$$

$$Q_{good} := Q(C_{90good})\cdot n$$

$$Q_{good} = 15.33\,m^3\cdot ha^{-1}\cdot yr^{-1}$$

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01c LINER LEAKAGE THROUGH COMPOSITE LINERS DUE TO GEOMEMBRANE DEFECTS - TYPE C SLOPES

References

Giroud JP, Soderman KL, Khire MV & Badu-Tweneboah K "New Developemts in Landfill LIner Leakage Evaluation" Proceedings of GeoEnvironment, Atlanta, USA, 1998

Units

$ha := 10000m^2$

Theory

In the context of this paper:

1. A composite liner consists of a synthetic component (a geomembrane) and a mineral component (a low permeability soil or a GCL)
2. The mineral content (low permeability medium) is located beneath the geomembrane.

For a circular or quasi circular defect the leakage rate through a composite liner is given as:

$$Q = C_{90} \cdot \left[1 + 0.1 \cdot \left(\frac{h}{t_{um}}\right)^{0.95}\right] \cdot a^{0.1} \cdot h^{0.9} \cdot k_{um}^{0.74}$$

Where

Q = leakage rate (m^3/s)

C_{90} = dimensionless coefficient that characterises the quality of contact between the geomembrane and the underlying medium

h = leachate head on top of the liner (m)

t_{um} = thickness of the low permeability medium underlying the geomembrane (m)

a = defect area (m^2)

k_{um} = permeability of the low permeability medium underlying the geomembrane (m/s)

Two typical values of C_{90} are considered:

$C_{90good} := 0.21$

$C_{90poor} := 1.15$

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The limits of the equation are as follows:

1. If a defect is circular, the defect diameter should not be less than 0.5 mm and not greater than 25 mm
2. The liquid head on top of the geomembrane should be equal to or less than 3 m
3. The hydraulic conductivity of the low permeability medium underlying the geomebrane, k_{um} should be equal to or less than k_G, where k_G is given by the following equation when the geomembrane defect is circular:

$$k_G = \left[\frac{0.3891 d^{1.8}}{C_{90} \cdot \left[1 + 0.1 \cdot \left(\frac{h}{t_{um}} \right)^{0.95} \right] \cdot h^{0.4}} \right]^{\frac{1}{0.74}}$$

Frequency and size of defects is recommended by Giroud and Bonapart (1989) as:

Installation Defects		
width - recommended high	5	mm
length - recommended high	20	mm
Defects density - intensively monitored installation	1	Defects/acre
Defects density - spot checks	10	Defects/acre
Giroud and Bonapart (1989)		

Parameters

Leachate head on top of the liner (m)		$h := 0.3m$
Thickness of the low permeability medium underlying the geomembrane (m)		$t_{um} := 600mm$
Defect area (m^2)	$a := 5mm \cdot 20mm$	$a = 1 \times 10^{-4} m^2$
Number of defects (assume good QA/QC)	$n := 1 \cdot acre^{-1}$	$n = 2.471 ha^{-1}$
Permeability of the low permeability medium underlying the geomembrane (m/s)	GCL spec	$k_{um} := 1 \cdot 10^{-8} cm \cdot s^{-1}$

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Calculations

Check applicability of equation

Equivalent defect diameter (m)
(if defect assumed to be circular)

$$d := \left(\frac{a \cdot 4}{\pi}\right)^{0.5} \qquad d = 1.128 \times 10^{-2}\,m$$

$$k_G(C_{90}) := \left[\frac{0.3891\left(\frac{d}{m}\right)^{1.8}}{C_{90}\cdot\left[1+0.1\cdot\left(\frac{\frac{h}{m}}{\frac{t_{um}}{m}}\right)^{0.95}\right]\cdot\left(\frac{h}{m}\right)^{0.4}}\right]^{\frac{1}{0.74}}\cdot m\cdot s^{-1}$$

$$Check_{poor} := \begin{cases} \text{"Equation not valid"} & \text{if } k_{um} > k_G(C_{90poor}) \\ \text{"Equation valid"} & \text{otherwise} \end{cases}$$

$$Check_{poor} = \text{"Equation valid"}$$

$$Check_{good} := \begin{cases} \text{"Equation not valid"} & \text{if } k_{um} > k_G(C_{90good}) \\ \text{"Equation valid"} & \text{otherwise} \end{cases}$$

$$Check_{good} = \text{"Equation valid"}$$

Calculate seepage rate per defect

$$Q(C_{90}) := \left[C_{90}\cdot\left[1+0.1\cdot\left(\frac{\frac{h}{m}}{\frac{t_{um}}{m}}\right)^{0.95}\right]\cdot\left(\frac{a}{m^2}\right)^{0.1}\cdot\left(\frac{h}{m}\right)^{0.9}\cdot\left(\frac{k_{um}}{m\cdot s^{-1}}\right)^{0.74}\right]\cdot m^3\cdot s^{-1}$$

$$Q(C_{90poor}) = 6.487 \times 10^{-9}\,m^3\cdot s^{-1}$$

$$Q(C_{90good}) = 1.185 \times 10^{-9}\,m^3\cdot s^{-1}$$

Calculate total seepage per hectare per year

$$Q_{poor} := Q(C_{90poor})\cdot n$$

$$Q_{poor} = 0.51\,m^3\cdot ha^{-1}\cdot yr^{-1}$$

$$Q_{good} := Q(C_{90good})\cdot n$$

$$Q_{good} = 0.09\,m^3\cdot ha^{-1}\cdot yr^{-1}$$

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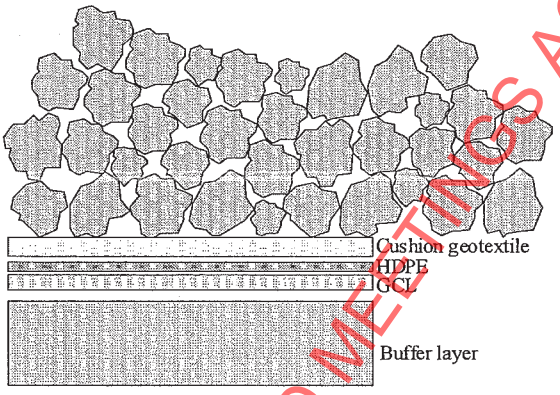
02 PUNCTURE RESISTANCE

The design procedure is based upon the work of Wilson-Fahmy, Narejo, and Koerner for the protection of a 1.5 mm thick HDPE geomembrane.

The empirical relationship is based upon a large number of ASTM5514 experiments. This requires a series of modification factors.



References

Puncture resistance of geotextiles - Koerner 4th Edition page 537

Modification factors

Protrusion shape	MF_S
Angular	1
Subrounded	0.5
Rounded	0.25

Packing density	MF_{PD}
Isolated	1
Dense, 38 mm	0.83
Dense, 25 mm	0.67
Dense, 12 mm	0.5

Arching	MF_A
Hydrostatic	1
Geostatic, shallow	0.75
Geostatic, moderate	0.5
Geostatic, deep	0.25

Reduction factors

Chemical & biological degradation	RF_{CBD}
Mild leachate	1.1
Moderate leachate	1.3
Harsh leachate	1.5

Long-term creep	RF_{CR}		
	Protrusion		
Mass per unit area (g/m2)	38	25	12
Geomembrane alone	NR	NR	NR
270	NR	NR	>1.5
550	NR	1.5	1.3
1100	1.3	1.2	1.1
>1100	1.2	1.1	1

Note: NR is not recommended

Units

$gram := 10^{-3}kg$

Parameters

Waste and draiange material parameters

Unit weight of waste $\gamma_w := 14kN \cdot m^{-3}$

Unit weight of drainage material $\gamma_{LCS} := 20kN \cdot m^{-3}$

Thickness of drainage stone $t_{LCS} := 0.5m$

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Protrusion parameters

Protrusion height (based on D50)	20/10 aggregate	$PH := 15mm$
Modification factor for protrusion shape	Well rounded	$MF_{SWR} := 0.25$
	Sub rounded	$MF_{SSR} := 0.5$
	Angular	$MF_{SA} := 1$
Modification factor for packing density		$MF_{PD} := 0.67$
Modification factor for arching in solids		$MF_A := 0.5$
Reduction factor for long term creep		$RF_{CR} := 1.3$
Reduction factor for long term chemical and biological degradation		$RF_{CBD} := 1.3$

Geomembrane

Factor of safety for stress on geomembrane $FS := 2$

Equations

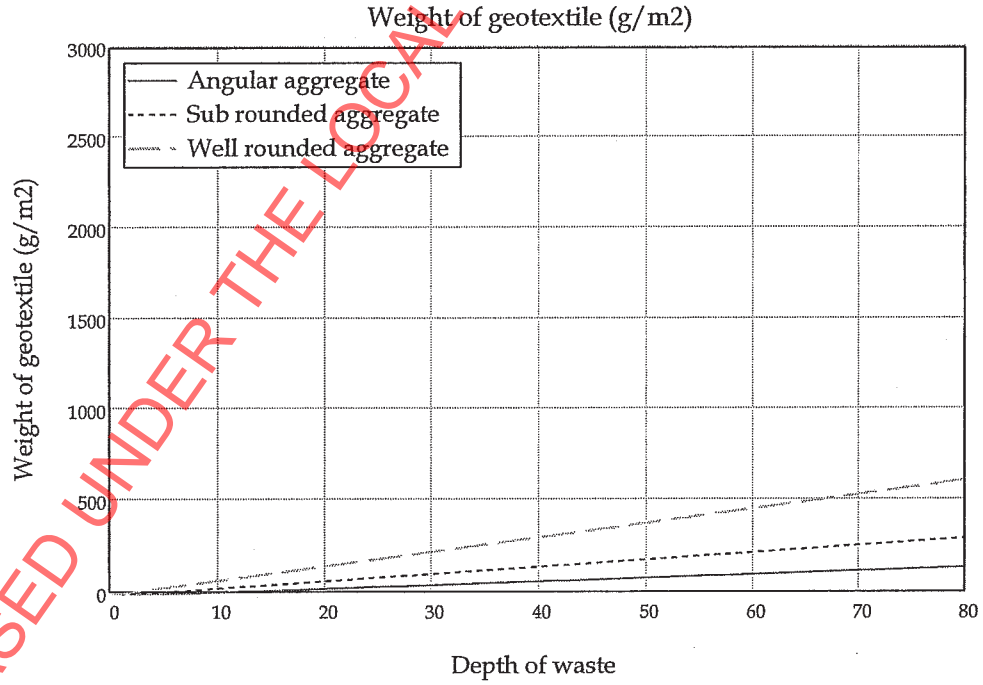
Allowable stress on geomembrane $p_{allow}(D) := FS \cdot (\gamma_w \cdot D + \gamma_{LCS} \cdot t_{LCS})$ $p_{allow}(80m) = 2260\,kPa$

Weight of geotextile

$$M(D, MF_S) := \frac{gram}{m^2} \cdot \frac{p_{allow}(D) \cdot kPa^{-1} \cdot (MF_S \cdot MF_{PD} \cdot MF_A) \cdot (RF_{CR} \cdot RF_{CBD}) - 50}{0.00045} \cdot (PH \cdot m^{-1})^2$$

Well rounded aggregate	$M(80m, MF_{SWR}) = 135\,gram \cdot m^{-2}$
Sub rounded aggregate	$M(80m, MF_{SSR}) = 295\,gram \cdot m^{-2}$
Angular	$M(80m, MF_{SA}) = 615\,gram \cdot m^{-2}$

Results



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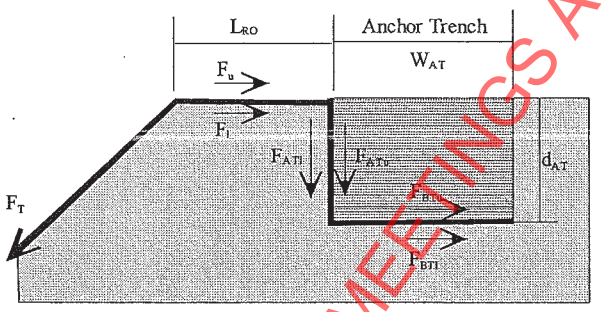
03 ANCHOR TRENCH STABILITY - LEVEL BACKFILL

The method is based upon an allowable stress in the geosynthetic of the liner system (a proportion of the ultimate material strength). If the service stress in the material is higher than the allowable stress, then the material will move and pull out of the anchor trench.

The HDPE is placed in the trench and backfilled.

Type B liner on fill slopes has no GCL component, and therefore there is no need for wet and dry analysis.



Reference

Robert M. Koerner 1990 " Designing with Geosynthetics" Edition 2 Page 428

Parameters

Liner Parameters

Ultimate geomembrane stress - yield or break (1.5mm) $T_{ult} := 22.5kN \cdot m^{-1}$

Factor of safety on geomembrane stress $FS := 1.5$

Allowable force $T_{allow} := \frac{T_{ult}}{FS}$ $T_{allow} = 15.0\,kN \cdot m^{-1}$

Friction angle between HDPE geomembrane and soil - low stress (upper interface) $\delta_u := 10deg$

Friction angle between HDPE geomembrane and soil (lower interface) $\delta_L := 26deg$

Trench Parameters

Run out length - distance from the trench to the slope crest $L_{RO} := 1m$

Width of anchor trench $w_{AT} := 1.5m$

Unit weight of backfill $\gamma := 19kN \cdot m^{-3}$

Backfill soil strength $\phi := 30deg$

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Total restraining force

Side wall of trench - average horizontal stress

$$F_T(d_{AT}, \delta_l) := \left| \begin{array}{l} \sigma_{vave} \leftarrow \gamma \cdot \frac{d_{AT}}{2} \\ K_o \leftarrow 1 - \sin(\phi) \\ \sigma_{have} \leftarrow \sigma_{vave} \cdot K_o \\ \sigma_v \leftarrow \gamma \cdot d_{AT} \\ F_u \leftarrow 0\,kN \cdot m^{-1} \\ F_l \leftarrow 0 \cdot kN \cdot m^{-1} \\ F_{ATu} \leftarrow \sigma_{have} \cdot \tan(\delta_u) \cdot d_{AT} \\ F_{ATl} \leftarrow \sigma_{have} \cdot \tan(\delta_l) \cdot d_{AT} \\ F_{BTu} \leftarrow \sigma_v \cdot \tan(\delta_u) \cdot w_{AT} \\ F_{BTl} \leftarrow \sigma_v \cdot \tan(\delta_l) \cdot w_{AT} \\ F_u + F_l + F_{ATu} + F_{ATl} + F_{BTu} + F_{BTl} \end{array} \right.$$

Coefficient of earth pressure at rest

Side wall of trench - average vertical stress

Vertical stress at bottom of trench

Friction along runout section at crest

Side wall of trench - upper interface

Side wall of trench - lower interface

Base of trench - upper interface

Base of trench - lower interface

Total restraining force

Results

Allowable stress in HDPE geomembrane $T_{allow} = 15\,kN \cdot m^{-1}$

Ultimate stress in HDPE geomembrane $T_{ult} = 22.5\,kN \cdot m^{-1}$

Runout length $L_{RO} = 1\,m$

Trench width $w_{AT} = 1.5\,m$

Depth of trench $D := 0.6m$

Total restraining force

Soil $F_T(D, \delta_L) = 12.491\,kN \cdot m^{-1}$

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04 INTRODUCTION TO LINER STRESS UNDER WASTE - KODIKARA

In geomembrane lined engineered landfills the placement of a leachate collection / liner protection layer and subsequent individual waste lifts can give rise to substantial down-slope shear stresses. These in turn can develop significant tension in the geomebrane. Geomembranes have limited tensile capacity and therefore, must be protected from these potentially high tensile stresses to ensure their long-term integrity as a leachate and landfill gas barrier. The Kodikara method provides a simplified analytical solution for the prediction of geomembrane tension taking into account the elasticity of both the geomembrane and underlying lining system, and the geomembrane-soil liner interface characteristics. It assesses the tension in the geomembrane on stable slopes under elastic conditions. The analysis is appropriate to geomembranes placed on side slopes and anchored on the bench at the top of the slope.

References

Kodikara J K (1996) "Prediction of tension in geomembranes placed on landfill slopes" Department of Civil and Building Engineering, Victoria University of Technology, Melbourne, Vic., Australia, Environmental Geotechnics Balkema ISBN 90 5410 8487 Volume 1 pp 557

Giroud J P and Beech J F (1989), "Stability of soil layers on geosynthetic lining systems", Proceedings Geosynthetics '89, IFAL, San Diego, California, USA, PP. 35-46

Wilson-Fahmy R F and Koerner R M (1993), "Finite element analysis of stability of cover soil on geomebrnae-lined slopes", Proceedings Geosythetics '93, Vancover, Canada, pp 1425-1437

Introduction

Alternative analysis methods predominantly adopt one of two approaches:

- the limit equilibrium method as in the traditional slope stability analysis (e.g. Giroud and Beech); and
- the load-displacement analysis such as finite element method (e.g. Wilson-Farhmy and Koerner, 1993).

The first approach assumes the lining system is on the verge of failure and the tension developed in the liner is assessed by considering the equilibrium of mobilised forces. This method ignores the stress-strain characteristics of the slope system, and is not suitable for analysing stable slopes under elastic conditions.

The second method is more general and rigorous, but it requires detailed input data for the slope and the lining materials.

Therefore a simplified analysis that takes into account the stress-strain compatibility of the slope materials, such as that proposed by Kodikara (1996), has considerable value in design.

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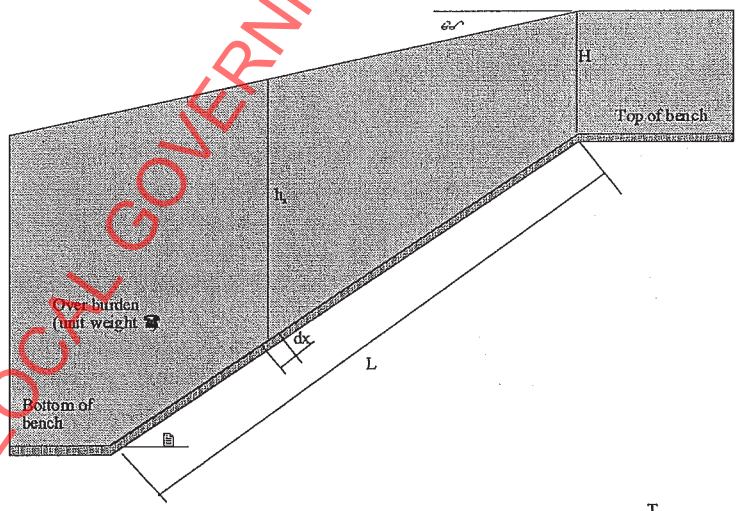
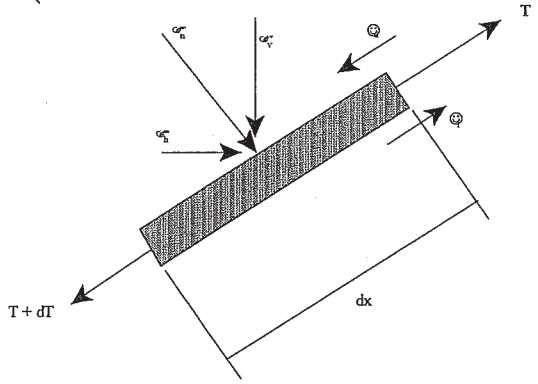
Analysis

Landfill side slopes are typically formed as a series of slopes with intermediate benches onto which the geomembrane liner is anchored. During landfilling operations, filling occurs in individual waste lifts which successively cover the slopes and benches. During this process, the weight of the overburden above a particular geomembrane liner is progressively transferred to the formation through the interfaces of the various layers (such as the waste, leachate collection / liner protection layer, protection geotextiles etc.) and lastly through the lower geomembrane interface. Therefore, the overburden induces shear and normal stresses at each interface.

If the applied shear stress at a particular interface exceeds the shear strength of that particular interface, relative movement occurs and the shear stress is transferred to the interface below. Therefore, the full shear stress generated by the overburden is only transferred to the geomembrane if slippage has taken place in all of the interfaces above the geomembrane. However, consideration of the full overburden weight on the geomembrane provides a conservative assessment and simplifies the analysis considerably. Therefore, the analysis adopts a general idealised model featuring a single slope and bench configuration (Figure 1(a)) and assumes the entire overburden is represented by a single material.



(a) Variables and definitions



(b) Stresses on a small geomembrane element

Figure 1: General idealisation of the problem

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The following is a summary of the derivation of the equations proposed by Kodikara (1996)

For a small element of geomembrane as shown in Figure 1(b) and assuming elastic behaviour, the governing differential equations can be expressed by equations (1), (2) and (3).

$$\frac{d}{dx}T = \tau_l - \tau_u \qquad \text{Equation 1}$$

$$\frac{d}{dx}u = \frac{T}{t \cdot E} \qquad \text{Equation 2}$$

$$\frac{d^2}{dx^2}u = \frac{1}{t \cdot E}\cdot(\tau_l - \tau_u) \qquad \text{Equation 3}$$

where u = displacement of the geomembrane liner at a distance x from the anchorage
t = thickness of the geomembrane
E = Young's modulus of the geomembrane
T = tension in the geomembrane at a distance x from the anchorage (tension positive)
τ_u = shear stress on the upper interface at a distance x from the anchorage
τ_l = shear stress on the lower interface at a distance x from the anchorage

The vertical (σ_v) and horizontal (σ_h) stresses above the liner (Figure 1) may be expressed as:

$$\sigma_v = h_x \cdot \gamma = (H + x\cdot\sin(\theta) - x\cdot\cos(\theta)\cdot\tan(\beta))\cdot\gamma \qquad \text{Equation 4}$$

$$\sigma_h = K_x \cdot \sigma_x \qquad \text{Equation 5}$$

where K_x represents the ratio of horizontal to vertical stresses developed during the placement of the leachate collection / liner protection and waste layers, and
γ represents the average bulk unit weight of overburden above the liner including waste.
Definitions of θ and β are given in Figure 1.
The liquid pressure above the liner is assumed to be insignificant.

If the vertical and horizontal stress system (equations (4) and (5)) represent the principal stress system for the medium above the liner, normal and shear stresses (σ_n, τ_u) on the upper interface of the liner can be expressed by equations (6) and (7). (It should be noted that this approximation may not be suitable for steep slopes).

$$\sigma_n = \sigma_v\cdot\sin(\theta)^2 + \sigma_h\cdot\cos(\theta)^2 \qquad \text{Equation 6}$$

$$\sigma_n = \left(K_x\cdot\cos(\theta)^2 + \sin(\theta)^2\right)\cdot(H + x\cdot\sin(\theta) - x\cdot\cos(\theta)\cdot\tan(\beta))\cdot\gamma$$

$$\tau_u = \frac{1}{2}\cdot(\sigma_v - \sigma_h)\cdot\sin(\theta)^2 \qquad \text{Equation 7}$$

$$\tau_u = \frac{1}{2}\cdot(1 - K_x)\cdot(h + x\cdot\sin(\theta) - x\cdot\cos(\theta)\cdot\tan(\beta))\cdot\gamma\cdot\sin(2\cdot\theta)$$

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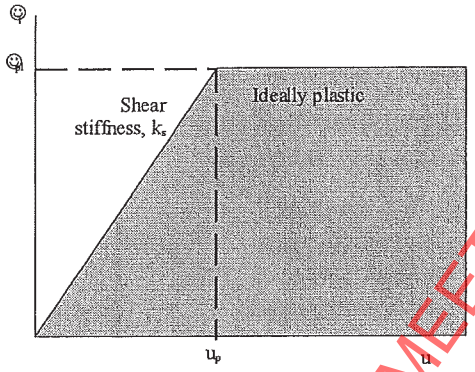
(a) Assumed interface response



(b) Possible states of interface behaviour

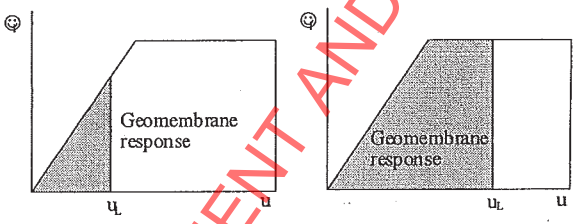


Figure 2: Geomembrane-soil liner interface characteristics

The shear stresses on the lower interface depend on the shear-displacement characteristics of the geomembrane-soil liner interface. For the analysis, an elastic-ideally plastic shear displacement response is assumed for this lower interface. Interface characteristics are defined by a shear stiffness (k_s) and a limiting shear stress based on the Mohr-Coulomb strength parameters (c_l and ϕ_t) (Figure 2(a)). The shear stiffness, ks, represents that of the material on which the geomembrane is placed. Typically, the geomembrane is placed on a soil liner with a certain thickness (D). Therefore, the method approximates ks by using the shear stiffness of the soil liner. For a shear modulus of G and simple shear conditions within the liner, k_s may be expressed as:

$$k_s = \frac{\tau_l}{u} = \frac{G}{D}$$

where τ_l is the shear stress at the lower interface, and
u represents the elastic shear displacement at this interface.

Other elastic solutions may also be used to define k_s under different field conditions.

Therefore, when the lower interface is in the elastic state, the governing differential equation is expressed by substituting from Equations (7) and (8) into Equation (3):

$$\frac{d^2}{dx^2}u - \frac{k_s}{t \cdot E} \cdot u = \frac{-\gamma \cdot \sin(2 \cdot \theta)}{2 \cdot t \cdot E} \cdot \left(1 - K_x\right) \cdot (H + x \cdot \sin(\theta) - x \cdot \cos(\theta) \cdot \tan(\beta))$$

Equation 9

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When the lower interface is in the plastic state, τ_l is equal to the limiting shear stress, τ_{lp}, and this can be expressed as:

$$\tau_l = \tau_{lp} = (\sigma_n - p_l)\cdot\tan(\phi_l) + c_l$$ Equation 10

where p_l represents any liquid pressure below the geomembrane liner.

Using the same approach as for elastic state, the resulting differential equation can be obtained by substituting for T_l from equations (6) and (10) into equation (3) as:

$$\frac{d^2}{dx^2}u = \left| \begin{array}{l} a \leftarrow \frac{1}{t\cdot E} \\ b \leftarrow K_x\cdot\cos(\theta) + \sin(\theta) \\ c \leftarrow H + x\cdot\sin(\theta) - x\cdot\cos(\theta)\cdot\tan(\beta) \\ d \leftarrow \frac{1}{2}\cdot(1 - K_x) \\ e \leftarrow H + x\cdot\sin(\theta) - x\cdot\cos(\theta)\cdot\tan(\beta)\cdot\gamma\cdot\sin(2\cdot\theta) \\ a\cdot\left[(b\cdot c - p_l)\cdot\tan(\phi_l) + c_l - d\cdot e\right] \end{array} \right.$$

Equation 11

The boundary conditions applicable to the problem are:

(a) x=L, T=0;
(b) x=0, u=0.

Equation (3) has to be solved while incorporating these boundary conditions. Although this equation can be solved in its dimensional form, the use of nondimensional variables provides a solution that is of greater general applicability.

The nondimensional variables Tx and ux are functions of:

$$\theta, \beta, \chi, \lambda, Hx, K_x, \phi_l, cx_l, px_l, xx$$ Equation 12

where:

$$\chi = \sqrt{\frac{k_s\cdot L^2}{t\cdot E}} \qquad cx_l = \frac{c_l}{\gamma\cdot L}$$

$$\lambda = \frac{\gamma\cdot L^2}{t\cdot E} \qquad px_l = \frac{p_l}{\gamma_L}$$

$$Hx = \frac{H}{L} \qquad xx = \frac{x}{L}$$

Theoretically, there are two states to be considered based on the interface characteristics assumed in Figure 2(a). These states can be identified as the lower interface behaving fully elastically or elastic-plastically as illustrated in Figure 2(b). The solutions for the fully elastic state can be obtained by solving equation (9) using the boundary conditions. For the elastic-plastic state, it is necessary to incorporate both Equation (9) and the differential equation for plastic state as given by Equation (11) with an additional elastic-plastic boundary defined at $x = L_p$ or $xx = L_p / L$. The continuity of the displacement and the tension in the geomembrane at this point gives the additional information required for the solution in this state.

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Whilst the solutions for the fully elastic state are explicit, the solution for the elastic-plastic state requires iterative computations because Lx_p is unknown. An examination of the solutions and numerous parametric conditions by Kodikara suggests that the non-dimensional variable χ tends to be large thereby rendering the value of e^{-x} very small. Therefore, the solutions can be further simplified by ignoring the terms containing e^{-x}.

Furthermore, the same condition tends to dominate the development of plasticity on the lower interface making the elastic-plastic solution virtually a state in which the geomembrane-soil liner interface behaves fully plastically. In other words, L_p or Lx_p would be so small that it can be approximated to zero in simplifying the solutions. Consequently, elastic-plastic state is not normally required, and the geomembrane performance can be assessed in either fully elastic or fully plastic states.

An elastic-plastic solution is not generally required

The explicit solutions can be used to predict the developed maximum tension at the anchorage (T_{max}) and the geomembrane displacement at the free end ($u_{x=L}$).

Fully elastic state

Dimensionless maximum tension

$$Tx_{max} = \frac{T_{max}}{t \cdot E} = \frac{-M}{\chi^2} - \frac{N}{\chi} \qquad \text{Equation 13}$$

Dimensionless maximum movement, at x=L

$$ux_L = \frac{u_L}{L} = \frac{M}{\chi^3} - \frac{1}{\chi^2} \cdot (M + N) \qquad \text{Equation 14}$$

where:

$$M = \frac{-\lambda}{2} \cdot (1 - K_x) \cdot \sin(2 \cdot \theta) \cdot (\sin(\theta) - \cos(\theta) \cdot \tan(\beta))$$

$$N = \frac{-\lambda}{2} Hx \cdot (1 - K_x) \cdot \sin(2\theta)$$

Fully plastic state

When

$$u_{pl} = \frac{\tau_{lp}}{k_s} \le u_L = L \cdot ux_L$$

Dimensionless maximum tension

$$Tx_{max} = \frac{T_{max}}{t \cdot E} = \frac{-M'}{2} - N' \qquad \text{Equation 15}$$

Dimensionless maximum movement, at x=L

$$ux_L = \frac{-M'}{3} - \frac{N'}{2} + \frac{\tau_{lpo}}{k_s \cdot L} \qquad \text{Equation 16}$$

where: First derivative of M

$$M' = \left| \begin{array}{l} a \leftarrow K_x \cdot \cos(\theta)^2 + \sin(\theta)^2 \\ b \leftarrow \sin(\theta) - \cos(\theta) \cdot \tan(\beta) \\ c \leftarrow 1 - k_x \\ \lambda \cdot a \cdot b \cdot \tan(\theta_l) - \frac{\lambda}{2} \cdot c \cdot b \cdot \sin(2 \cdot \theta) \end{array} \right.$$

First derivative of N

$$N' = \left| \begin{array}{l} a \leftarrow \lambda \cdot \left[\left(K_x \cdot \cos(\theta)^2 + \sin(\theta)^2 \right) \cdot Hx - px_l \right] \cdot \tan(\phi_l) \\ b \leftarrow \lambda \cdot cx_l \\ c \leftarrow \frac{\lambda}{2} \cdot Hx \cdot (1 - K_x) \cdot \sin(2 \cdot \theta) \\ a + b - c \end{array} \right.$$

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04b LINER STRESS UNDER WASTE - KODIKARA - TYPE B LINER

Parameters

Slope angle (1 on X)		$X_B := 2$
Slope height		$Height_B := 6m$
Geomembrane angle	$\theta_B := atan\left(\frac{1}{X_B}\right)$	$\theta_B = 26.565\,deg$
Surface slope angle		$\beta := 0deg$
Length of slope along slope	$Length_B := \sqrt{Height_B^2 + (X_B \cdot Height_B)^2}$	$Length_B = 13.416\,m$
Depth of fill over geomembrane at the top of the slope		$h_B := 65m$
Coefficient of lateral earth pressure		$K_x := 0.5$
Unit weight of fill over geomembrane		$\gamma := 14kN \cdot m^{-3}$
Geomembrane interface friction angle		$\phi_1 := 26deg$
Geomembrane interface cohesion		$c_1 := 0kPa$
Liquid pressure below geomembrane		$p_1 := 0kPa$
Thickness of geomembrane		$t := 1.5mm$
Geomembrane modulus of elasticity (allowing for creep)		$E := 180MPa$
Ultimate tensile stress		$T_{ult} := 22.5 \cdot kN \cdot m^{-1}$
Factor of safety		$FS := 1.5$
Maximum allowable tensile stress	$T_{allow} := \frac{T_{ult}}{FS}$	$T_{allow} = 15\,kN \cdot m^{-1}$
Clay liner shear modulus		$G_{clay} := 25MPa$
Depth of clay liner below geomembrane		$D := 0.6m$
Clay liner stiffness	$k_s := \frac{G_{clay}}{D}$	$k_s = 41.667\,m^{-1}\,MPa$
Non dimensional parameters		
	$\chi := \sqrt{\frac{k_s \cdot Length_B^2}{t \cdot E}}$	$\chi = 166.667$
	$\lambda := \frac{\gamma \cdot Length_B^2}{t \cdot E}$	$\lambda = 9.333$
	$Hx := \frac{h_B}{Length_B}$	$Hx = 4.845$
	$cx_1 := \frac{c_1}{\gamma \cdot Length_B}$	$cx_1 = 0$
	$px_1 := \frac{p_1}{\gamma \cdot Length_B}$	$px_1 = 0$

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Maximum displacement - plastic (from equation 16 and 10)

$$u_{pL} := \left| \begin{array}{l} x \leftarrow Length_B \\ a \leftarrow K_x \cdot \cos(\theta_B)^2 + \sin(\theta_B)^2 \\ b \leftarrow h_B + x \cdot \sin(\theta_B) - x \cdot \cos(\theta_B) \cdot \tan(\beta) \\ \sigma_n \leftarrow a \cdot b \cdot \gamma \\ \tau_{lp} \leftarrow (\sigma_n - p_l) \cdot \tan(\phi_l) + c_l \\ \frac{\tau_{lp}}{k_s} \end{array} \right.$$

$u_{pL} = 6.981\,mm$

Maximum displacement - elastic (from equation 14)

$$u_L := \left| \begin{array}{l} \chi \leftarrow \sqrt{\frac{k_s \cdot Length_B^2}{t \cdot E}} \\ \lambda \leftarrow \frac{\gamma \cdot Length_B^2}{t \cdot E} \\ M \leftarrow \frac{-\lambda}{2} \cdot (1 - K_x) \cdot \sin(2 \cdot \theta_B) \cdot (\sin(\theta_B) - \cos(\theta_B) \cdot \tan(\beta)) \\ N \leftarrow \frac{-\lambda}{2} \cdot Hx \cdot (1 - K_x) \cdot \sin(2 \cdot \theta_B) \\ ux_L \leftarrow \frac{M}{\chi^3} - \frac{1}{\chi^2} \cdot (M + N) \\ Length_B \cdot ux_L \end{array} \right.$$

$u_L = 4.769\,mm$

Determine whether the condition is fully plastic or fully elastic.

$$cond_B := \left| \begin{array}{ll} \text{"Fully elastic"} & \text{if } u_{pL} > u_L \\ \text{"Fully plastic"} & \text{otherwise} \end{array} \right.$$

$cond_B = \text{"Fully elastic"}$

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Non dimensional maximum tension in the geomembrane

$$Tx_{max} := \left| \begin{array}{l} \lambda \leftarrow \dfrac{\gamma \cdot Length_B^{\,2}}{t \cdot E} \\ \text{if } u_{pL} > u_L \\ \quad \left| \begin{array}{l} \chi \leftarrow \sqrt{\dfrac{k_s \cdot Length_B^{\,2}}{t \cdot E}} \\ M \leftarrow \dfrac{-\lambda}{2} \cdot (1 - K_x) \cdot \sin(2 \cdot \theta_B) \cdot (\sin(\theta_B) - \cos(\theta_B) \cdot \tan(\beta)) \\ N \leftarrow \dfrac{-\lambda}{2} \cdot Hx \cdot (1 - K_x) \cdot \sin(2 \cdot \theta_B) \\ \dfrac{-M}{\chi^2} - \dfrac{N}{\chi} \end{array} \right. \\ \text{otherwise} \\ \quad \left| \begin{array}{l} M' \leftarrow \left| \begin{array}{l} a \leftarrow K_x \cdot \cos(\theta_B)^2 + \sin(\theta_B)^2 \\ b \leftarrow \sin(\theta_B) - \cos(\theta_B) \cdot \tan(\beta) \\ c \leftarrow 1 - K_x \\ \lambda \cdot a \cdot b \cdot \tan(\phi_1) - \dfrac{\lambda}{2} \cdot c \cdot b \cdot \sin(2 \cdot \theta_B) \end{array} \right. \\ N' \leftarrow \left| \begin{array}{l} a \leftarrow K_x \cdot \cos(\theta_B)^2 + \sin(\theta_B)^2 \\ b \leftarrow \lambda \cdot (a \cdot Hx - px_1) \cdot \tan(\phi_1) \\ c \leftarrow \lambda \cdot cx_1 \\ d \leftarrow \dfrac{\lambda}{2} \cdot Hx \cdot (1 - K_x) \cdot \sin(2 \cdot \theta_B) \\ b + c - d \end{array} \right. \\ \dfrac{-M'}{2} - N' \end{array} \right. \end{array} \right.$$

$$Tx_{max} = 0.054$$

Maximum tension in the geomembrane

$$T_{max} := Tx_{max} \cdot t \cdot E \qquad T_{max} = 14.66\,kN \cdot m^{-1}$$

Maximum tensile stress in the geomembrane

$$\sigma_{tmax} := \frac{T_{max}}{t} \qquad \sigma_{tmax} = 9.77\,MPa$$

Check that the maximum anchorage tension is acceptable

$$Check_B := \left| \begin{array}{ll} \text{"Tension in geomembrane acceptable"} & \text{if } T_{max} < T_{allow} \\ \text{"Too much tension in geomembrane"} & \text{otherwise} \end{array} \right.$$

$Check_B$ = "Tension in geomembrane acceptable"

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04c LINER STRESS UNDER WASTE - KODIKARA - TYPE C LINER

Parameters

Slope angle (1 on X) $X_C := 1$

Slope height $Height_C := 6m$

Geomembrane angle $\theta_C := atan\left(\frac{1}{X_C}\right)$ $\theta_C = 45\,deg$

Surface slope angle $\beta := 0deg$

Length of slope along slope $Length_C := \sqrt{Height_C^2 + (X_C \cdot Height_C)^2}$ $Length_C = 8.485\,m$

Depth of fill over geomembrane at the top of the slope $h_C := 50m$

Coefficient of lateral earth pressure $K_x := 0.5$

Unit weight of fill over geomembrane $\gamma := 14kN \cdot m^{-3}$

Geomembrane interface friction angle $\phi_l := 26deg$

Geomembrane interface cohesion $c_l := 0kPa$

Liquid pressure below geomembrane $p_l := 0kPa$

Thickness of geomembrane $t := 1.5mm$

Geomembrane modulus of elasticity (allowing for creep) $E := 180MPa$

Ultimate tensile stress $T_{ult} := 22.5 \cdot kN \cdot m^{-1}$

Factor of safety $FS := 1.5$

Maximum allowable tensile stress $T_{allow} := \frac{T_{ult}}{FS}$ $T_{allow} = 15\,kN \cdot m^{-1}$

Clay liner shear modulus $G_{clay} := 25MPa$

Depth of clay liner below geomembrane $D := 0.6m$

Clay liner stiffness $k_s := \frac{G_{clay}}{D}$ $k_s = 41.667\,m^{-1}MPa$

Non dimensional parameters

$\chi := \sqrt{\frac{k_s \cdot Length_C^2}{t \cdot E}}$ $\chi = 105.409$

$\lambda := \frac{\gamma \cdot Length_C^2}{t \cdot E}$ $\lambda = 3.733$

$Hx := \frac{h_C}{Length_C}$ $Hx = 5.893$

$cx_l := \frac{c_l}{\gamma \cdot Length_C}$ $cx_l = 0$

$px_l := \frac{p_l}{\gamma \cdot Length_C}$ $px_l = 0$

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Maximum displacement - plastic (from equation 16 and 10)

$$u_{pL} := \left| \begin{array}{l} x \leftarrow Length_C \\ a \leftarrow K_x \cdot \cos(\theta_C)^2 + \sin(\theta_C)^2 \\ b \leftarrow h_C + x \cdot \sin(\theta_C) - x \cdot \cos(\theta_C) \cdot \tan(\beta) \\ \sigma_n \leftarrow a \cdot b \cdot \gamma \\ \tau_{lp} \leftarrow (\sigma_n - p_l) \cdot \tan(\phi_l) + c_l \\ \dfrac{\tau_{lp}}{k_s} \end{array} \right.$$

$u_{pL} = 6.883\,mm$

Maximum displacement - elastic (from equation 14)

$$u_L := \left| \begin{array}{l} \chi \leftarrow \sqrt{\dfrac{k_s \cdot Length_C^{\,2}}{t \cdot E}} \\ \lambda \leftarrow \dfrac{\gamma \cdot Length_C^{\,2}}{t \cdot E} \\ M \leftarrow \dfrac{-\lambda}{2} \cdot (1 - K_x) \cdot \sin(2 \cdot \theta_C) \cdot (\sin(\theta_C) - \cos(\theta_C) \cdot \tan(\beta)) \\ N \leftarrow \dfrac{-\lambda}{2} \cdot Hx \cdot (1 - K_x) \cdot \sin(2 \cdot \theta_C) \\ ux_L \leftarrow \dfrac{M}{\chi^3} - \dfrac{1}{\chi^2} \cdot (M + N) \\ Length_C \cdot ux_L \end{array} \right.$$

$u_L = 4.699\,mm$

Determine whether the condition is fully plastic or fully elastic.

$$cond_C := \left| \begin{array}{ll} \text{"Fully elastic"} & \text{if } u_{pL} > u_L \\ \text{"Fully plastic"} & \text{otherwise} \end{array} \right.$$

$cond_C =$ "Fully elastic"

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Non dimensional maximum tension in the geomembrane

$$Tx_{max} := \left| \begin{array}{l} \lambda \leftarrow \dfrac{\gamma \cdot Length_C^{\,2}}{t \cdot E} \\ \text{if } u_{pL} > u_L \\ \quad \left| \begin{array}{l} \chi \leftarrow \sqrt{\dfrac{k_s \cdot Length_C^{\,2}}{t \cdot E}} \\ M \leftarrow \dfrac{-\lambda}{2} \cdot (1 - K_x) \cdot \sin(2 \cdot \theta_C) \cdot (\sin(\theta_C) - \cos(\theta_C) \cdot \tan(\beta)) \\ N \leftarrow \dfrac{-\lambda}{2} \cdot Hx \cdot (1 - K_x) \cdot \sin(2 \cdot \theta_C) \\ \dfrac{-M}{\chi^2} - \dfrac{N}{\chi} \end{array} \right. \\ \text{otherwise} \\ \quad \left| \begin{array}{l} M' \leftarrow \left| \begin{array}{l} a \leftarrow K_x \cdot \cos(\theta_C)^2 + \sin(\theta_C)^2 \\ b \leftarrow \sin(\theta_C) - \cos(\theta_C) \cdot \tan(\beta) \\ c \leftarrow 1 - K_x \\ \lambda \cdot a \cdot b \cdot \tan(\phi_1) - \dfrac{\lambda}{2} \cdot c \cdot b \cdot \sin(2 \cdot \theta_C) \end{array} \right. \\ N' \leftarrow \left| \begin{array}{l} a \leftarrow K_x \cdot \cos(\theta_C)^2 + \sin(\theta_C)^2 \\ b \leftarrow \lambda \cdot (a \cdot Hx - px_1) \cdot \tan(\phi_1) \\ c \leftarrow \lambda \cdot cx_1 \\ d \leftarrow \dfrac{\lambda}{2} \cdot Hx \cdot (1 - K_x) \cdot \sin(2 \cdot \theta_C) \\ b + c - d \end{array} \right. \\ \dfrac{-M'}{2} - N' \end{array} \right. \end{array} \right.$$

$Tx_{max} = 0.052$

Maximum tension in the geomembrane $T_{max} := Tx_{max} \cdot t \cdot E$ $T_{max} = 14.1\,kN \cdot m^{-1}$

Maximum tensile stress in the geomembrane $\sigma_{tmax} := \dfrac{T_{max}}{t}$ $\sigma_{tmax} = 9.4\,MPa$

Check that the maximum anchorage tension is acceptable

$$Check_C := \left| \begin{array}{l} \text{"Tension in geomembrane acceptable"} \quad \text{if } T_{max} < T_{allow} \\ \text{"Too much tension in geomembrane"} \quad \text{otherwise} \end{array} \right.$$

$Check_C$ = "Tension in geomembrane acceptable"

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04d LINER STRESS UNDER WASTE - KODIKARA - TYPE D LINER

Parameters

Slope angle (1 on X)		$X_D := 0.5$
Slope height		$Height_D := 6m$
Geomembrane angle	$\theta_D := atan\left(\frac{1}{X_D}\right)$	$\theta_D = 63.435\,deg$
Surface slope angle		$\beta := 0deg$
Length of slope along slope	$Length_D := \sqrt{Height_D^2 + (X_D \cdot Height_D)^2}$	$Length_D = 6.708\,m$
Depth of fill over geomembrane at the top of the slope		$h_D := 65m$
Coefficient of lateral earth pressure		$K_x := 0.5$
Unit weight of fill over geomembrane		$\gamma := 14kN \cdot m^{-3}$
Geomembrane interface friction angle		$\phi_1 := 26deg$
Geomembrane interface cohesion		$c_1 := 0kPa$
Liquid pressure below geomembrane		$p_1 := 0kPa$
Thickness of geomembrane		$t := 1.5mm$
Geomembrane modulus of elasticity (allowing for creep)		$E := 180MPa$
Ultimate tensile stress		$T_{ult} := 22.5 \cdot kN \cdot m^{-1}$
Factor of safety		$FS := 1.5$
Maximum allowable tensile stress	$T_{allow} := \frac{T_{ult}}{FS}$	$T_{allow} = 15\,kN \cdot m^{-1}$
Clay liner shear modulus		$G_{clay} := 25MPa$
Depth of clay liner below geomembrane		$D := 0.6m$
Clay liner stiffness	$k_s := \frac{G_{clay}}{D}$	$k_s = 41.667\,m^{-1}MPa$
Non dimensional parameters		
	$\chi := \sqrt{\frac{k_s \cdot Length_D^2}{t \cdot E}}$	$\chi = 83.333$
	$\lambda := \frac{\gamma \cdot Length_D^2}{t \cdot E}$	$\lambda = 2.333$
	$Hx := \frac{h_D}{Length_D}$	$Hx = 9.69$
	$cx_1 := \frac{c_1}{\gamma \cdot Length_D}$	$cx_1 = 0$
	$px_1 := \frac{p_1}{\gamma \cdot Length_D}$	$px_1 = 0$

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Maximum displacement - plastic (from equation 16 and 10)

$$u_{pL} := \left| \begin{array}{l} x \leftarrow Length_D \\ a \leftarrow K_x \cdot \cos(\theta_D)^2 + \sin(\theta_D)^2 \\ b \leftarrow h_D + x \cdot \sin(\theta_D) - x \cdot \cos(\theta_D) \cdot \tan(\beta) \\ \sigma_n \leftarrow a \cdot b \cdot \gamma \\ \tau_{lp} \leftarrow (\sigma_n - p_l) \cdot \tan(\phi_l) + c_l \\ \dfrac{\tau_{lp}}{k_s} \end{array} \right.$$

$u_{pL} = 10.472\,mm$

Maximum displacement - elastic (from equation 14)

$$u_L := \left| \begin{array}{l} \chi \leftarrow \sqrt{\dfrac{k_s \cdot Length_D^{\,2}}{t \cdot E}} \\ \lambda \leftarrow \dfrac{\gamma \cdot Length_D^{\,2}}{t \cdot E} \\ M \leftarrow \dfrac{-\lambda}{2} \cdot (1 - K_x) \cdot \sin(2 \cdot \theta_D) \cdot (\sin(\theta_D) - \cos(\theta_D) \cdot \tan(\beta)) \\ N \leftarrow \dfrac{-\lambda}{2} \cdot Hx \cdot (1 - K_x) \cdot \sin(2 \cdot \theta_D) \\ ux_L \leftarrow \dfrac{M}{\chi^3} - \dfrac{1}{\chi^2} \cdot (M + N) \\ Length_D \cdot ux_L \end{array} \right.$$

$u_L = 4.766\,mm$

Determine whether the condition is fully plastic or fully elastic.

$$cond_D := \left| \begin{array}{ll} \text{"Fully elastic"} & \text{if } u_{pL} > u_L \\ \text{"Fully plastic"} & \text{otherwise} \end{array} \right.$$

$cond_D = \text{"Fully elastic"}$

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Non dimensional maximum tension in the geomembrane

$$Tx_{max} := \left| \begin{array}{l} \lambda \leftarrow \dfrac{\gamma \cdot Length_D^{\,2}}{t \cdot E} \\ \text{if } u_{pL} > u_L \\ \quad \left| \begin{array}{l} \chi \leftarrow \sqrt{\dfrac{k_s \cdot Length_D^{\,2}}{t \cdot E}} \\ M \leftarrow \dfrac{-\lambda}{2} \cdot (1 - K_x) \cdot \sin(2 \cdot \theta_D) \cdot (\sin(\theta_D) - \cos(\theta_D) \cdot \tan(\beta)) \\ N \leftarrow \dfrac{-\lambda}{2} \cdot Hx \cdot (1 - K_x) \cdot \sin(2 \cdot \theta_D) \\ \dfrac{-M}{\chi^2} - \dfrac{N}{\chi} \end{array} \right. \\ \text{otherwise} \\ \quad \left| \begin{array}{l} M' \leftarrow \left| \begin{array}{l} a \leftarrow K_x \cdot \cos(\theta_D)^2 + \sin(\theta_D)^2 \\ b \leftarrow \sin(\theta_D) - \cos(\theta_D) \cdot \tan(\beta) \\ c \leftarrow 1 - K_x \\ \lambda \cdot a \cdot b \cdot \tan(\phi_1) - \dfrac{\lambda}{2} \cdot c \cdot b \cdot \sin(2 \cdot \theta_D) \end{array} \right. \\ N' \leftarrow \left| \begin{array}{l} a \leftarrow K_x \cdot \cos(\theta_D)^2 + \sin(\theta_D)^2 \\ b \leftarrow \lambda \cdot (a \cdot Hx - px_1) \cdot \tan(\phi_1) \\ c \leftarrow \lambda \cdot cx_1 \\ d \leftarrow \dfrac{\lambda}{2} \cdot Hx \cdot (1 - K_x) \cdot \sin(2 \cdot \theta_D) \\ b + c - d \end{array} \right. \\ \dfrac{-M'}{2} - N' \end{array} \right. \end{array} \right.$$

$Tx_{max} = 0.054$

Maximum tension in the geomembrane

$T_{max} := Tx_{max} \cdot t \cdot E$ $\quad T_{max} = 14.67\,kN \cdot m^{-1}$

Maximum tensile stress in the geomembrane

$\sigma_{tmax} := \dfrac{T_{max}}{t}$ $\quad \sigma_{tmax} = 9.78\,MPa$

Check that the maximum anchorage tension is acceptable

$$Check_D := \left| \begin{array}{l} \text{"Tension in geomembrane acceptable"} \quad \text{if } T_{max} < T_{allow} \\ \text{"Too much tension in geomembrane"} \quad \text{otherwise} \end{array} \right.$$

$Check_D = \text{"Tension in geomembrane acceptable"}$

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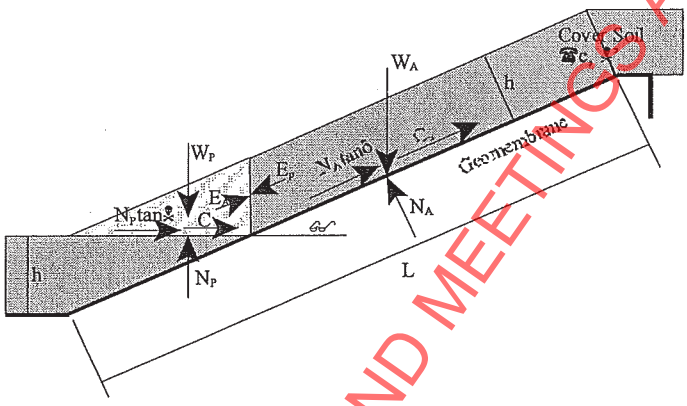
05b LINER CONSTRUCTION STABILITY DRY WITH REINFORCEMENT - KOERNER 1997 - TYPE B SLOPE

The analysis assumes that the cover material is dry.
By analysing the free body diagram for the equilibrium of the active and passive wedges, the formulation for the global factor of safety can be determined. The resulting equation is not explicit for the factor of safety and is solved using the solution to a quadratic equation. The analysis closely follows that of Giroud & Beech and that of Koerner & Hwu.



By equating E_p to E_a the solution for the factor of safety is in the form of a quadratic:

$$a(FofS)^2 + b(FofS) + c = 0$$

References

Koerner (1997) "Designing with Geosynthetics" Fifth Edition Prentice Hall ISBN 0 13 726175 6 pp 381 to 387

Parameters

Unit weight of water		$\gamma_w := 9.81kN \cdot m^{-3}$
Depth of leachate collection stone		$h := 0.3m$
Dry unit weight of collection stone		$\gamma := 19kN \cdot m^{-3}$
Internal angle of friction for stone		$\phi' := 35deg$
Soil cohesion		$c' := 0kPa$
Adhesion between geomembrane and soil		$c_a := 0kPa$
Design slope angle		$X_D := 2$
Design lift height of LCS	Half slope height	$Height_D := 3m$
Interface friction angle between soil cover and geomembrane		$\delta_D := 10deg$
Length of slope	$Length(X,H) := \sqrt{H^2 + (H \cdot X)^2}$	
	$Length_D := Length(X_D, Height_D)$	$Length_D = 6.708\,m$
Ultimate strength of Geogrid	Fortrac 20/13-20	$T_{ult} := 10kN \cdot m^{-1}$
Reduction factors		$RF := 1.2$

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Equations

Slope angle

$$FoS(x, L, \delta, T) := \beta \leftarrow \operatorname{atan}\left(\frac{1}{x}\right)$$

Active wedge self weight

$$W_A \leftarrow \gamma \cdot h^2 \cdot \left(\frac{L}{h} - \frac{1}{\sin(\beta)} - \frac{\tan(\beta)}{2}\right)$$

Active wedge normal force

$$N_A \leftarrow W_A \cdot \cos(\beta)$$

Active wedge adhesion force

$$C_a \leftarrow c_a \cdot \left(L - \frac{h}{\sin(\beta)}\right)$$

Passive wedge self weight

$$W_P \leftarrow \frac{\gamma \cdot h^2}{\sin(2 \cdot \beta)}$$

Passive wedge adhesion force

$$C \leftarrow \frac{c' \cdot h}{\sin(\beta)}$$

Solution to quadratic

$$a \leftarrow \left(W_A - N_A \cdot \cos(\beta) - T \cdot \sin(\beta)\right) \cdot \cos(\beta)$$

$$m \leftarrow \left(W_A - N_A \cdot \cos(\beta) - T \cdot \sin(\beta)\right) \cdot \sin(\beta) \cdot \tan(\phi')$$

$$n \leftarrow \left(N_A \cdot \tan(\delta) + C_a\right) \cdot \sin(\beta) \cdot \cos(\beta)$$

$$o \leftarrow \sin(\beta) \cdot \left(C + W_P \cdot \tan(\phi')\right)$$

$$b \leftarrow -(m + n + o)$$

$$c \leftarrow \left(N_A \cdot \tan(\delta) + C_a\right) \cdot \sin(\beta)^2 \cdot \tan(\phi')$$

Calculated factor of safety

$$\frac{-b + \sqrt{b^2 - 4 \cdot a \cdot c}}{2 \cdot a}$$

Results

Design condition

$$FoS\left(X_D, Length_D, \delta_D, \frac{T_{ult}}{RF}\right) = 1.133$$

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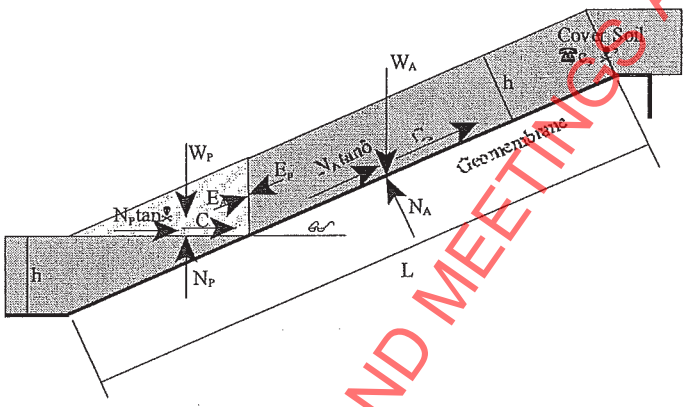
05c LINER CONSTRUCTION STABILITY DRY WITH REINFORCEMENT - KOERNER 1997 - TYPE C SLOPE

The analysis assumes that the cover material is dry.
By analysing the free body diagram for the equilibrium of the active and passive wedges, the formulation for the global factor of safety can be determined. The resulting equation is not explicit for the factor of safety and is solved using the solution to a quadratic equation. The analysis closely follows that of Giroud & Beech and that of Koerner & Hwu.



By equating E_p to E_a the solution for the factor of safety is in the form of a quadratic:

$a(FofS)^2 + b(FofS) + c = 0$

References

Koerner (1997) "Designing with Geosynthetics" Fifth Edition Prentice Hall ISBN 0 13 726175 6 pp 381 to 387

Units

$kN := 1000N$

Parameters

Unit weight of water		$\gamma_w := 9.81kN \cdot m^{-3}$
Depth of leachate collection stone layer		$h := 0.3m$
Dry unit weight of collection stone		$\gamma := 19kN \cdot m^{-3}$
Internal angle of friction for stone		$\phi' := 35deg$
Soil cohesion		$c' := 0kPa$
Adhesion between geomembrane and soil		$c_a := 0kPa$
Design slope angle		$X_D := 1$
Design lift height of LCS	Half slope height	$Height_D := 3m$
Interface friction angle between soil cover and geomembrane		$\delta_D := 10deg$
Length of slope	$Length(X,H) := \sqrt{H^2 + (H \cdot X)^2}$	
	$Length_D := Length(X_D, Height_D)$	$Length_D = 4.243\,m$
Ultimate strength of Geogrid	Fortrac 20/13-20	$T_{ult} := 10kN \cdot m^{-1}$
Reduction factors		$RF := 1.2$

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Equations

Slope angle

$$FofS(x, L, \delta, T) := \beta \leftarrow \operatorname{atan}\left(\frac{1}{x}\right)$$

Active wedge self weight

$$W_A \leftarrow \gamma \cdot h^2 \cdot \left(\frac{L}{h} - \frac{1}{\sin(\beta)} - \frac{\tan(\beta)}{2}\right)$$

Active wedge normal force

$$N_A \leftarrow W_A \cdot \cos(\beta)$$

Active wedge adhesion force

$$C_a \leftarrow c_a \cdot \left(L - \frac{h}{\sin(\beta)}\right)$$

Passive wedge self weight

$$W_P \leftarrow \frac{\gamma \cdot h^2}{\sin(2 \cdot \beta)}$$

Passive wedge adhesion force

$$C \leftarrow \frac{c' \cdot h}{\sin(\beta)}$$

Solution to quadratic

$$a \leftarrow \left(W_A - N_A \cdot \cos(\beta) - T \cdot \sin(\beta)\right) \cdot \cos(\beta)$$

$$m \leftarrow \left(W_A - N_A \cdot \cos(\beta) - T \cdot \sin(\beta)\right) \cdot \sin(\beta) \cdot \tan(\phi')$$

$$n \leftarrow \left(N_A \cdot \tan(\delta) + C_a\right) \cdot \sin(\beta) \cdot \cos(\beta)$$

$$o \leftarrow \sin(\beta) \cdot \left(C + W_P \cdot \tan(\phi')\right)$$

$$b \leftarrow -(m + n + o)$$

$$c \leftarrow \left(N_A \cdot \tan(\delta) + C_a\right) \cdot \sin(\beta)^2 \cdot \tan(\phi')$$

Calculated factor of safety

$$\frac{-b + \sqrt{b^2 - 4 \cdot a \cdot c}}{2 \cdot a}$$

Results

Design condition

$$FofS\left(X_D, Length_D, \delta_D, \frac{T_{ult}}{RF}\right) = 1.112$$

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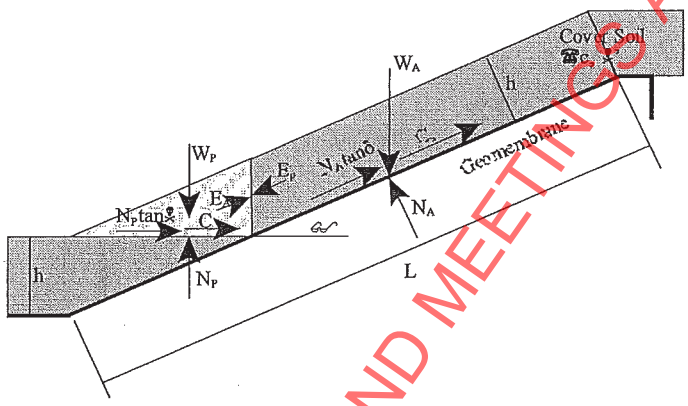
05d LINER CONSTRUCTION STABILITY DRY WITH REINFORCEMENT - KOERNER 1997 - TYPE D SLOPE

The analysis assumes that the cover material is dry.
By analysing the free body diagram for the equilibrium of the active and passive wedges, the formulation for the global factor of safety can be determined. The resulting equation is not explicit for the factor of safety and is solved using the solution to a quadratic equation. The analysis closely follows that of Giroud & Beech and that of Koerner & Hwu.



By equating E_p to E_a the solution for the factor of safety is in the form of a quadratic:

$$a(FofS)^2 + b(FofS) + c = 0$$

References

Koerner (1997) "Designing with Geosynthetics" Fifth Edition Prentice Hall ISBN 0 13 726175 6 pp 381 to 387

Parameters

Unit weight of water		$\gamma_w := 9.81kN \cdot m^{-3}$
Depth of leachate collection stone layer	Allowing for xmas tree placement	$h := 0.9m$
Dry unit weight of collection stone		$\gamma := 19kN \cdot m^{-3}$
Internal angle of friction for stone		$\phi' := 35deg$
Soil cohesion		$c' := 0kPa$
Adhesion between geomembrane and soil		$c_a := 0kPa$
Design slope angle		$X_D := 0.5$
Design lift height of LCS		$Height_D := 3m$
Interface friction angle between soil cover and geomembrane		$\delta_D := 10deg$
Length of slope	$Length(X,H) := \sqrt{H^2 + (H \cdot X)^2}$	
	$Length_D := Length(X_D, Height_D)$	$Length_D = 3.354\,m$
Ultimate strength of Geogrid	Fortrac 20/13-20	$T_{ult} := 10kN \cdot m^{-1}$
Reduction factors		$RF := 1.2$

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Equations

Slope angle

$$FofS(x, L, \delta, T) := \beta \leftarrow \operatorname{atan}\left(\frac{1}{x}\right)$$

Active wedge self weight

$$W_A \leftarrow \gamma \cdot h^2 \cdot \left(\frac{L}{h} - \frac{1}{\sin(\beta)} - \frac{\tan(\beta)}{2}\right)$$

Active wedge normal force

$$N_A \leftarrow W_A \cdot \cos(\beta)$$

Active wedge adhesion force

$$C_a \leftarrow c_a \cdot \left(L - \frac{h}{\sin(\beta)}\right)$$

Passive wedge self weight

$$W_P \leftarrow \frac{\gamma \cdot h^2}{\sin(2 \cdot \beta)}$$

Passive wedge adhesion force

$$C \leftarrow \frac{c' \cdot h}{\sin(\beta)}$$

Solution to quadratic

$$a \leftarrow \left(W_A - N_A \cdot \cos(\beta) - T \cdot \sin(\beta)\right) \cdot \cos(\beta)$$

$$m \leftarrow \left(W_A - N_A \cdot \cos(\beta) - T \cdot \sin(\beta)\right) \cdot \sin(\beta) \cdot \tan(\phi')$$

$$n \leftarrow \left(N_A \cdot \tan(\delta) + C_a\right) \cdot \sin(\beta) \cdot \cos(\beta)$$

$$o \leftarrow \sin(\beta) \cdot \left(C + W_P \cdot \tan(\phi')\right)$$

$$b \leftarrow -(m + n + o)$$

$$c \leftarrow \left(N_A \cdot \tan(\delta) + C_a\right) \cdot \sin(\beta)^2 \cdot \tan(\phi')$$

Calculated factor of safety

$$\frac{-b + \sqrt{b^2 - 4 \cdot a \cdot c}}{2 \cdot a}$$

Results

Design condition

$$FofS\left(X_D, Length_D, \delta_D, \frac{T_{ult}}{RF}\right) = 3.669$$

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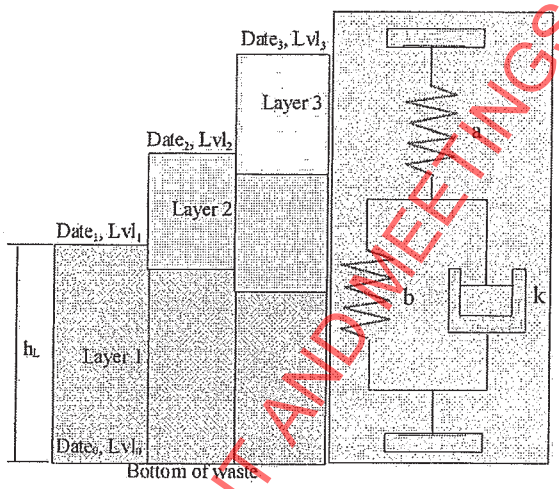
06 WASTE SETTLEMENT RHEOLOGICAL MODEL

The Gibson & Lo model (Edil et al 1990) simulates the stress-strain relationship dependence with time.

The model estimates the immediate settlement of waste due to an applied load based on a Hookean spring element "a". In the longer term the refuse skeleton supporting the load creeps, rearranges, and settles. This secondary settlement is represented by a Kelvin element of a spring in parallel with a dashpot. The additional strain is represented by a spring "b", which is retarded by a linear Newtonian dashpot with a viscosity of "λ/b". In addition to this outline approach, in waste, the stiffness of the springs varies considerably with vertical stress. The values of the spring stiffnesses for "a" and "b", and their relationship with stress, are provided by Rao et al (1977) from Blieker et al (1995). Edil et al (1990) provides recorded values for the dashpot constant Lambda "λ",



$$\xi_{tot}(\sigma, \Delta t) = \sigma \cdot \left[a(\sigma) + b(\sigma) \cdot \left(1 - e^{\frac{-\lambda}{b(\sigma)} \cdot \Delta t} \right) \right]$$

The rheological model adopts the effective stress for the formulation of functions to assess the settlement and the settlement characteristics of the waste. In this application the waste is assumed to be drained. Therefore the effective stress through the waste profile is the same as the total stress through the profile, and thus the total stress is used to compute the settlement characteristics.

Reference

D.E. Bleiker et al (1995) "Landfill settlement and the impact on site capacity and refuse hydraulic conductivity" Waste Management & Research (1995) 13, pp 533-554

T.B. Edil, V.J. Ranguette, W.W.Wuellner (1990) "Settlement of municipal refuse" Geotechnics of waste fills - Theory and Practice ASTM STP 1070 pp 225 - Provides data on coefficients for particular landfills

Parameters

Rate of secondary compression 'k' for waste. This determines the characteristic of compression following load placement.
The reported range for fresh waste is between $2.35 \cdot 10^{-5}$ and $6.08 \cdot 10^{-8}$

$$k = \frac{\lambda}{b}$$

$\lambda := 1 \cdot 10^{-7} \cdot kPa^{-1} \cdot day^{-1}$

Maximum date of interest for the assessment of waste settlement i.e. generally well beyond the last date of waste placement.

Lastyear := 60yr

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Waste filling sequence definition

The waste filling sequence. The first row must always be the initial base level and date of start of filling.

Data is set out as follows:

- Col 0 - Date
- Col 1 - Level of waste on that date
- Col 2 - Bulk unit weight of waste as placed

The bulk unit weight is on placement with compaction, if used, but before further waste is placed over it.

Fill :=

	0	1	2
0	0	0	10
1	0.3	2	10
2	0.6	4	10
3	0.9	6	10
4	1.333	8	10
5	1.766	10	10
6	2.2	12	10
7	2.6	14	10
8	3	16	10
9	3.4	18	10
10	3.8	20	10
11	4.2	22	10
12	4.6	24	10
13	5	26	10
14	5.4	28	10
15	5.8	30	10
16	6.2	32	10
17	6.6	34	10
18	7	36	10
19	7.433	38	10
20	7.866	40	10
21	8.3	42	10
22	8.9	44	10
23	9.5	46	10
24	10.1	48	10
25	10.967	50	10
26	11.834	52	10
27	12.7	54	10

Date $Date := Fill^{\langle 0 \rangle} \cdot yr$

Level to which the waste is filled on date $Lvl := Fill^{\langle 1 \rangle} \cdot m$

Bulk unit weight of waste as placed $\gamma_w := Fill^{\langle 2 \rangle} \cdot kN \cdot m^{-3}$

Number of layers in waste profile $N_L := length\left(Fill^{\langle 0 \rangle}\right) - 1$ $N_L = 27$

Waste type modifications

The spring constants "a" and "b" are derived from large scale laboratory work for fresh MSW. If the waste is not MSW these should be amended to reflect the proportion that is MSW

The vertical stress that a volume of waste can induce is function of the waste density, and it is this stress that is used to derive the spring constants. However, the constants are a measure of the stiffness of the waste and as such the skeleton stiffness is only related to the density of the skeleton

MSW proportion of waste $MSW_{propa} := 3$

$MSW_{propb} := 6$

Waste settlement characteristic coefficients and functions

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Results

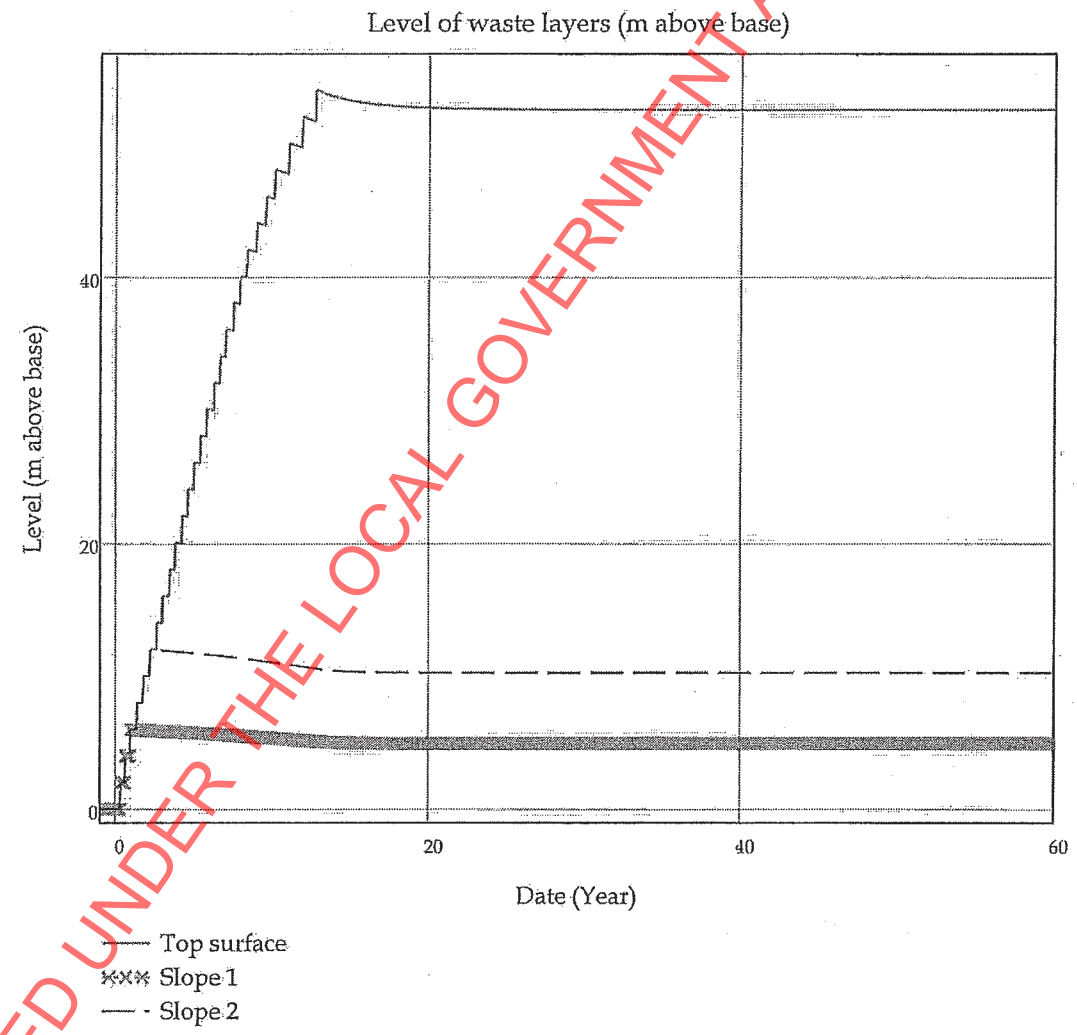
Variation in Slope 1 with time

$Level_T(0.9yr, 3) = 6\,m$
$Level_L(15yr, 3) = 4.988\,m$
$Level_L(50yr, 3) = 4.945\,m$
$Level_L(60yr, 3) = 4.945\,m$

Maximum settlement to be accommodated for Slope 1

$Settlement := Level_L(0.9yr, 3) - Level_L(50yr, 3)$

$Settlement = 1.055\,m$



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Appendix E: Phase 1 & 2 leachate simulation

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01 LEACHATE GENERATION INTRODUCTION

Various deterministic and stochastic models have been developed for the estimation of leachate generation rates in landfills. The inherent inhomogeneity and complexity of landfills generally renders the estimates that these models produce approximations at best.

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Factors that contribute to the generation of leachate:

- cover type
- leachate that is transported into the landfill with the waste
- rainfall patterns
- groundwater ingress to the waste
- surface water ingress at the perimeter of the landfill

Leachate in incoming waste

Municipal solid waste generally contains some water associated with particular types of waste. This proportion varies depending on the type of waste:

- 10% by weight Sub tropical wet season
- 5% by weight Sub tropical dry season
- 0% to 2.5% by weight Temperate

Landfill cover type

The type of cover to the waste has a significant influence on the proportion of surface water that directly enters the waste through the surface. Typical values as a percentage of rainfall are as follows:

Typical values used in sub tropical climates (eg Hong Kong)

Cover type	Infiltration proportion
Open active areas	1
Short term interim cover (500mm soil)	0.25
Long term interim cover (500mm compacted soil)	0.1
Long term interim cover by geomebrane	0.025
Final cover system including geomembrane + drainage	0.0001

Typical values used in temperate climates

Cover tpye	Infiltration proportion
Earth cap (>0.3m)	0.28
Clay cap (1m)	0.2
Clay cap (1m) + drainage + topsoil	0.1
Clay cap (1m) + geomebrane + drainage + topsoil	0.02

Empirical water balance models

Empirical models for leachate generation use rainfall and areas of different cover types to derive a leachate flow rate. The rainfall can be daily or annual rainfall.

Use of daily rainfall requires the consideration of the lag between a rainfall event and the collection of the leachate, which can be a number of days, and the consideration attenuation effects associated with the waste mass, which is generally an averaging of the leachate flow prediction over tens of days. Thus such a model can only generally be used when calibrated against an existing record to determine these factors. The use of records from an open landfill where the operating areas are constantly changing further complicates the

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issues.

The use of annual rainfall over comes the problems associated with lag and attenuation but the results provide only an annual averaged value for leachate generation, which is of little use in determining the maximum probable values of leachate generation for the design of collection systems, lagoons, and treatment plants.

Water balance components

The various components of a water balance model are:

- The net infiltration of water through the cover system (inherently accounting for runoff and evapotranspitration).
- Infiltration of surface water at the edges of the landfill directly to leachate collection stone etc.
- Ingress of groundwater at the perimeter of the landfill.
- Egress of leachate through the liner system at the base of the landfill.
- Egress through the perimeter walls of a landfill depending upon flow regimes.

The remainder can be considered to be collected leachate

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02a LANDFILL LEACHATE SIMULATION DAILY MODEL - BASE CASE

The contribution of a rainfall event on a particular day provides a response in the leachate collection systems that is dispersed over a number of days that follow. For many landfills, across a wide range of plan areas, this is about four days. The response is not an average across the four days, but has a peak before it diminishes towards the end of the period.

Units

$ha := 10^4 \cdot m^2$

Parameters

Cap type	Area of cap type	Proportion of rainfall that infiltrates cap type
Open active areas	$A_{active} := 1ha$	$Inf_{active} := 1$
Short term interim cover	$A_{Stemp} := 5ha$	$Inf_{Stemp} := 0.28$
Long term interim cover	$A_{Ltemp} := 16.2ha$	$Inf_{Ltemp} := 0.1$
Long term interim cover with geomembrane	$A_{Gtemp} := 0ha$	$Inf_{Gtemp} := 0.025$
Final cover system with geomembrane	$A_{perm} := 0ha$	$Inf_{perm} := 0.0001$

Waste intake for the landfill: $Intake := 140000tonne \cdot yr^{-1}$ $Intake = 383\,tonne \cdot day^{-1}$

Degree of free water held in the delivered waste that contributes to leachate generation: $Waste_{free} := 2.5\%$

Base flow in the system is presumed to be constant: $Bflow := Intake \frac{m^3}{tonne} \cdot Waste_{free}$ $Bflow = 9.58\,m^3 \cdot day^{-1}$

The lag in the landfill waste and collection system before a rainfall event on a particular day has any measurable effect at the leachate collection system outlet.

There are short cut routes through the waste mass to the collection system and the lag is generally zero days

$lagSys := 0$ days

The time over which a rainfall event will contribute to the flow in the leachate collection system

This is generally only a few days, for an average landfill of a few hectares, or a landfill consisting of cells of <10 hectares this is in the order of 4 days. For a landfill of effectively one cell of about 60 hectares it can be 8 days.

$lagRain := 4$ days

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Rainfall records

A long-term prediction of the response of the landfill collection system is derived on the basis of a long-term rainfall pattern.

Record - 1 Jan 2001 to 31 May 2006.

Histrec :=

	0
0	0
1	0
2	0
3	0
4	0
5	0
6	0
7	1
8	0
9	0
10	0
11	0
12	0
13	1
14	0
15	1

Number of records $RecN := last(Histrec^{\langle 0 \rangle})$

Rainfall (mm) $HRain := Histrec^{\langle 0 \rangle} \cdot mm$

The simulation starts at the commencement date plus (lagRain+lagSys) days

lagRain + lagSys = 4

Counter $i := (lagRain + lagSys) .. RecN$

Landfill response characteristic

The following determines the contribution distribution throughout the lagRain period.

Not all the rainfall in the period of contribution to collection flows contributes equally to the leachate the collection flow on any given day.

"Char" is the estimated response characteristic for a small landfill. This is a combination of the generic response for active areas and for areas with temporary cover - these dominate the response due to their high infiltration rates.

Char :=

	0	1
0	0	0
1	1	0.29
2	2	0.36
3	3	0.35
4	4	0.32
5	5	0.27
6	6	0.19
7	7	0.1
8	8	0
9		

Total number of daily records

$Nchar := last(Char^{\langle 0 \rangle})$

Nchar = 8 days

Corrected periods for the length of the required characteristic $x1 := \frac{Char^{\langle 0 \rangle} \cdot lagRain}{Nchar}$

Proportion of rainfall contributing in a particular interval $y1 := Char^{\langle 1 \rangle}$

Function representing the proportion of rainfall allocated to each of the intervals $p := loess(x1, y1, 0.75)$

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Discount the values that are less than zero

$$prop1(d) := \begin{cases} num \leftarrow interp(p, x1, y1, d) \\ 0 \text{ if } num \le 0 \\ num \text{ otherwise} \end{cases}$$

Factor to determine the difference in total rainfall contribution over lagRain

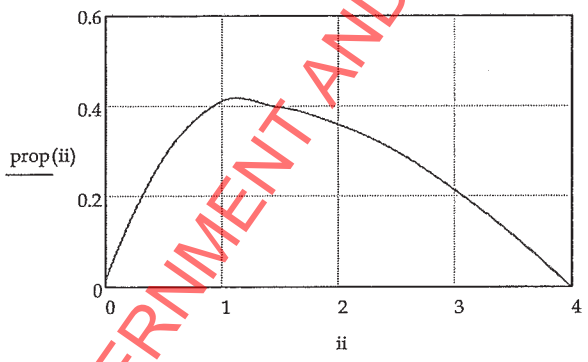
$$Factor := \sum_{i=0}^{lagRain} prop1(i) \qquad Factor = 0.892$$

Function for apportioning rainfall contribution on a daily basis

$$prop(d) := \frac{1}{Factor} \cdot prop1(d)$$

Check that the total rainfall contribution sums to unity

$$\sum_{i=0}^{lagRain} prop(i) = 1.000$$



Leachate collection flow function

The leachate on an particular day is the sum of the contributions from the rainfalls on all previous days from "lagRain+lagSys" to day "lagSys". The proportion of the each rainfall event is determined by "prop".

The relevant proportion "prop" has to be measured forwards from d - lagRain to i

$$Simul(d, R, A, I) := \begin{cases} bb \leftarrow \sum_{i=d-(lagRain+lagSys)}^{d-lagSys} \left(R_i \cdot prop(lagRain + i - d)\right) \\ bb \cdot A \cdot I \cdot day^{-1} \end{cases}$$

Leachate collection flow

Leachate collection flow simulation

$$Leach_i := \begin{cases} a \leftarrow Simul(i, HRain, A_{active}, Inf_{active}) \\ b \leftarrow Simul(i, HRain, A_{Stemp}, Inf_{Stemp}) \\ c \leftarrow Simul(i, HRain, A_{Ltemp}, Inf_{Ltemp}) \\ d \leftarrow Simul(i, HRain, A_{Gtemp}, Inf_{Gtemp}) \\ e \leftarrow Simul(i, HRain, A_{perm}, Inf_{perm}) \\ a + b + c + d + e + Bflow \end{cases}$$

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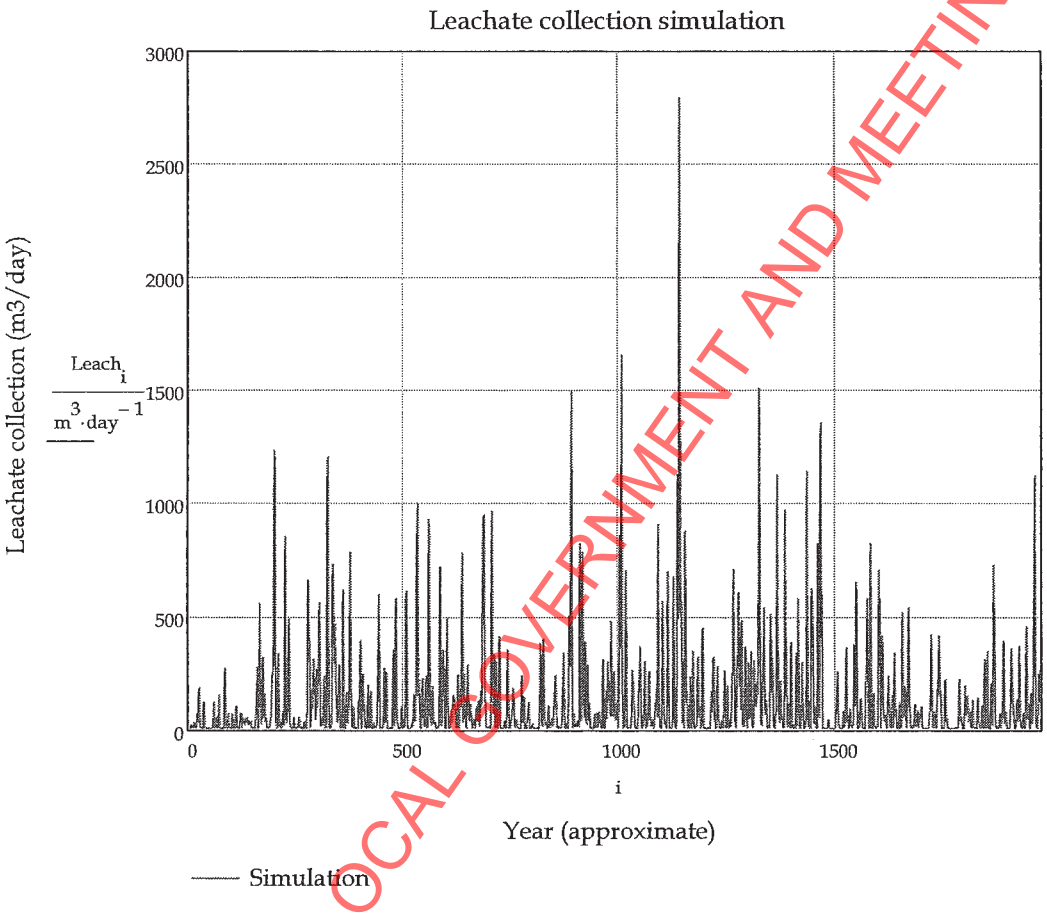
Results

Maximum predicted leachate collection $Max_{leach} := max(Leach)$ $Max_{leach} = 2795\,m^3 \cdot day^{-1}$

Average predicted leachate collection $Av_{leach} := mean(Leach)$ $Av_{leach} = 139\,m^3 \cdot day^{-1}$



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02b LANDFILL LEACHATE SIMULATION DAILY MODEL - LOWER BOUND

The contribution of a rainfall event on a particular day provides a response in the leachate collection systems that is dispersed over a number of days that follow. For many landfills, across a wide range of plan areas, this is about four days. The response is not an average across the four days, but has a peak before it diminishes towards the end of the period.

Units

$ha := 10^4 \cdot m^2$

Parameters

Cap type	Area of cap type	Proportion of rainfall that infiltrates cap type
Open active areas	$A_{active} := 1ha$	$Inf_{active} := 1$
Short term interim cover	$A_{Stemp} := 5ha$	$Inf_{Stemp} := 0.28$
Long term interim cover	$A_{Ltemp} := 16.2ha$	$Inf_{Ltemp} := 0.1$
Long term interim cover with geomembrane	$A_{Gtemp} := 0ha$	$Inf_{Gtemp} := 0.025$
Final cover system with geomembrane	$A_{perm} := 0ha$	$Inf_{perm} := 0.0001$

Waste intake for the landfill: $Intake := 126000 \cdot tonne \cdot yr^{-1}$ $Intake = 345\,tonne \cdot day^{-1}$

Degree of free water held in the delivered waste that contributes to leachate generation: $Waste_{free} := 2.5\%$

Base flow in the system is presumed to be constant: $Bflow := Intake \frac{m^3}{tonne} \cdot Waste_{free}$ $Bflow = 8.62\,m^3 \cdot day^{-1}$

The lag in the landfill waste and collection system before a rainfall event on a particular day has any measurable effect at the leachate collection system outlet.

There are short cut routes through the waste mass to the collection system and the lag is generally zero days

$lagSys := 0$ days

The time over which a rainfall event will contribute to the flow in the leachate collection system

This is generally only a few days, for an average landfill of a few hectares, or a landfill consisting of cells of <10 hectares this is in the order of 4 days. For a landfill of effectively one cell of about 60 hectares it can be 8 days.

$lagRain := 4$ days

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Rainfall records

A long-term prediction of the response of the landfill collection system is derived on the basis of a long-term rainfall pattern.

Record - 1 Jan 2001 to 31 May 2006.

Histrec :=

	0
0	0
1	0
2	0
3	0
4	0
5	0
6	0
7	1
8	0
9	0
10	0
11	0
12	0
13	1
14	0
15	1

Number of records $RecN := last(Histrec^{\langle 0 \rangle})$

Rainfall (mm) $HRain := Histrec^{\langle 0 \rangle} \cdot mm$

The simulation starts at the commencement date plus (lagRain+lagSys) days

lagRain + lagSys = 4

Counter $i := (lagRain + lagSys) .. RecN$

Landfill response characteristic

The following determines the contribution distribution throughout the lagRain period.

Not all the rainfall in the period of contribution to collection flows contributes equally to the leachate the collection flow on any given day.

"Char" is the estimated response characteristic for a small landfill. This is a combination of the generic response for active areas and for areas with temporary cover - these dominate the response due to their high infiltration rates.

Char :=

	0	1
0	0	0
1	1	0.29
2	2	0.36
3	3	0.35
4	4	0.32
5	5	0.27
6	6	0.19
7	7	0.1
8	8	0
9		

Total number of daily records

$Nchar := last(Char^{\langle 0 \rangle})$

Nchar = 8 days

Corrected periods for the length of the required characteristic $x1 := \frac{Char^{\langle 0 \rangle} \cdot lagRain}{Nchar}$

Proportion of rainfall contributing in a particular interval $y1 := Char^{\langle 1 \rangle}$

Function representing the proportion of rainfall allocated to each of the intervals $p := loess(x1, y1, 0.75)$

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Discount the values that are less than zero

$$prop1(d) := \begin{cases} num \leftarrow interp(p, x1, y1, d) \\ 0 \text{ if } num \le 0 \\ num \text{ otherwise} \end{cases}$$

Factor to determine the difference in total rainfall contribution over lagRain

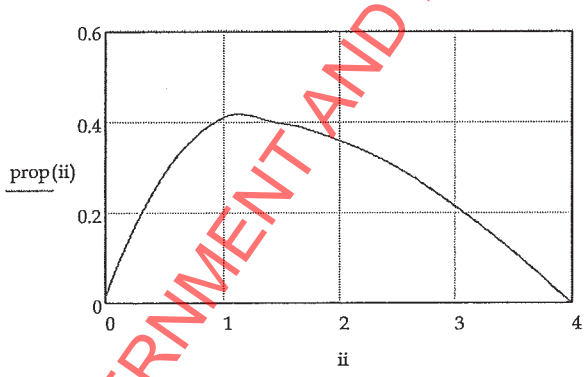
$$Factor := \sum_{i=0}^{lagRain} prop1(i) \qquad Factor = 0.892$$

Function for apportioning rainfall contribution on a daily basis

$$prop(d) := \frac{1}{Factor} \cdot prop1(d)$$

Check that the total rainfall contribution sums to unity

$$\sum_{i=0}^{lagRain} prop(i) = 1.000$$



Leachate collection flow function

The leachate on an particular day is the sum of the contributions from the rainfalls on all previous days from "lagRain+lagSys" to day "lagSys". The proportion of the each rainfall event is determined by "prop".

The relevant proportion "prop" has to be measured forwards from d - lagRain to i

$$Simul(d, R, A, I) := \begin{cases} bb \leftarrow \sum_{i=d-(lagRain+lagSys)}^{d-lagSys} \left(R_i \cdot prop(lagRain + i - d)\right) \\ bb \cdot A \cdot I \cdot day^{-1} \end{cases}$$

Leachate collection flow

Leachate collection flow simulation

$$Leach_i := \begin{cases} a \leftarrow Simul(i, HRain, A_{active}, Inf_{active}) \\ b \leftarrow Simul(i, HRain, A_{Stemp}, Inf_{Stemp}) \\ c \leftarrow Simul(i, HRain, A_{Ltemp}, Inf_{Ltemp}) \\ d \leftarrow Simul(i, HRain, A_{Gtemp}, Inf_{Gtemp}) \\ e \leftarrow Simul(i, HRain, A_{perm}, Inf_{perm}) \\ a + b + c + d + e + Bflow \end{cases}$$

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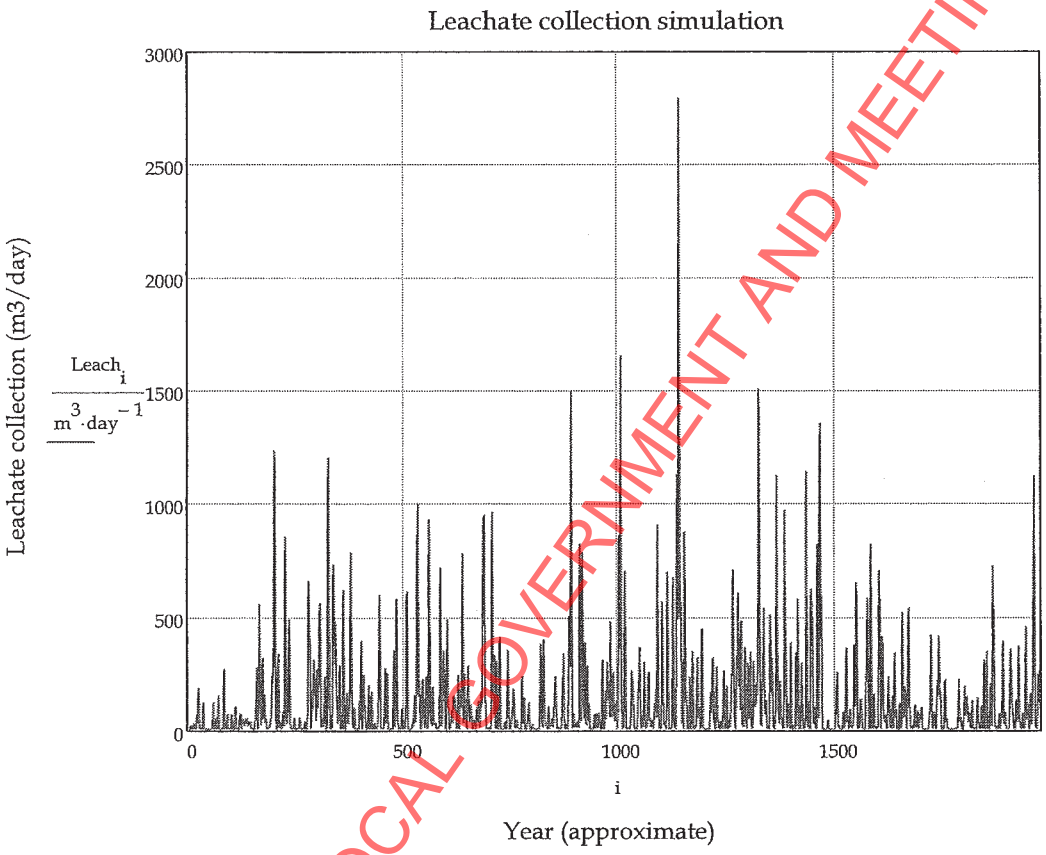
Results

Maximum predicted leachate collection $Max_{leach} := max(Leach)$ $Max_{leach} = 2794\,m^3 \cdot day^{-1}$

Average predicted leachate collection $Av_{leach} := mean(Leach)$ $Av_{leach} = 138\,m^3 \cdot day^{-1}$



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02c LANDFILL LEACHATE SIMULATION DAILY MODEL - UPPER BOUND

The contribution of a rainfall event on a particular day provides a response in the leachate collection systems that is dispersed over a number of days that follow. For many landfills, across a wide range of plan areas, this is about four days. The response is not an average across the four days, but has a peak before it diminishes towards the end of the period.

Units

$ha := 10^4 \cdot m^2$

Parameters

Cap type	Area of cap type	Proportion of rainfall that infiltrates cap type
Open active areas	$A_{active} := 1ha$	$Inf_{active} := 1$
Short term interim cover	$A_{Stemp} := 5ha$	$Inf_{Stemp} := 0.28$
Long term interim cover	$A_{Ltemp} := 16.2ha$	$Inf_{Ltemp} := 0.1$
Long term interim cover with geomembrane	$A_{Gtemp} := 0ha$	$Inf_{Gtemp} := 0.025$
Final cover system with geomembrane	$A_{perm} := 0ha$	$Inf_{perm} := 0.0001$
Waste intake for the landfill	$Intake := 154000tonne \cdot yr^{-1}$	$Intake = 422\,tonne \cdot day^{-1}$
Degree of free water held in the delivered waste that contributes to leachate generation		$Waste_{free} := 2.5\%$
Base flow in the system is presumed to be constant	$Bflow := Intake \frac{m^3}{tonne} \cdot Waste_{free}$	$Bflow = 10.54\,m^3 \cdot day^{-1}$
The lag in the landfill waste and collection system before a rainfall event on a particular day has any measurable effect at the leachate collection system outlet.	There are short cut routes through the waste mass to the collection system and the lag is generally zero days	$lagSys := 0$ days
The time over which a rainfall event will contribute to the flow in the leachate collection system	This is generally only a few days, for an average landfill of a few hectares, or a landfill consisting of cells of <10 hectares this is in the order of 4 days. For a landfill of effectively one cell of about 60 hectares it can be 8 days.	$lagRain := 4$ days

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Rainfall records

A long-term prediction of the response of the landfill collection system is derived on the basis of a long-term rainfall pattern.

Record - 1 Jan 2001 to 31 May 2006.

Histrec :=

	0
0	0
1	0
2	0
3	0
4	0
5	0
6	0
7	1
8	0
9	0
10	0
11	0
12	0
13	1
14	0
15	1

Number of records $RecN := last(Histrec^{\langle 0 \rangle})$

Rainfall (mm) $HRain := Histrec^{\langle 0 \rangle} \cdot mm$

The simulation starts at the commencement date plus (lagRain+lagSys) days

lagRain + lagSys = 4

Counter $i := (lagRain + lagSys) .. RecN$

Landfill response characteristic

The following determines the contribution distribution throughout the lagRain period.

Not all the rainfall in the period of contribution to collection flows contributes equally to the leachate the collection flow on any given day.

"Char" is the estimated response characteristic for a small landfill. This is a combination of the generic response for active areas and for areas with temporary cover - these dominate the response due to their high infiltration rates.

Char :=

	0	1
0	0	0
1	1	0.29
2	2	0.36
3	3	0.35
4	4	0.32
5	5	0.27
6	6	0.19
7	7	0.1
8	8	0
9		

Total number of daily records

$Nchar := last(Char^{\langle 0 \rangle})$

Nchar = 8 days

Corrected periods for the length of the required characteristic $x1 := \frac{Char^{\langle 0 \rangle} \cdot lagRain}{Nchar}$

Proportion of rainfall contributing in a particular interval $y1 := Char^{\langle 1 \rangle}$

Function representing the proportion of rainfall allocated to each of the intervals $p := loess(x1, y1, 0.75)$

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Discount the values that are less than zero

$$prop1(d) := \begin{| num \leftarrow interp(p, x1, y1, d) \\ 0 \text{ if } num \le 0 \\ num \text{ otherwise}$$

Factor to determine the difference in total rainfall contribution over lagRain

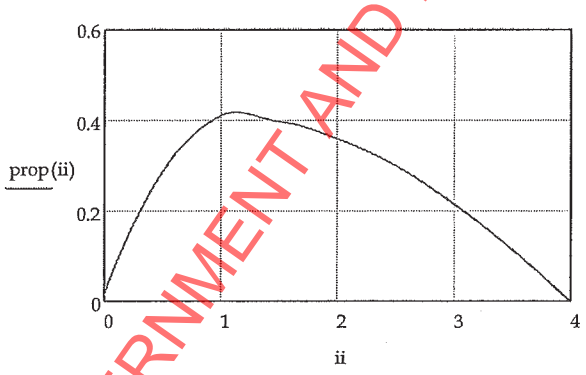
$$Factor := \sum_{i=0}^{lagRain} prop1(i) \qquad Factor = 0.892$$

Function for apportioning rainfall contribution on a daily basis

$$prop(d) := \frac{1}{Factor} \cdot prop1(d)$$

Check that the total rainfall contribution sums to unity

$$\sum_{i=0}^{lagRain} prop(i) = 1.000$$



Leachate collection flow function

The leachate on an particular day is the sum of the contributions from the rainfalls on all previous days from "lagRain+lagSys" to day "lagSys". The proportion of the each rainfall event is determined by "prop".

The relevant proportion "prop" has to be measured forwards from d - lagRain to i

$$Simul(d, R, A, I) := \begin{| bb \leftarrow \sum_{i=d-(lagRain+lagSys)}^{d-lagSys} \left(R_i \cdot prop(lagRain + i - d)\right) \\ bb \cdot A \cdot I \cdot day^{-1}$$

Leachate collection flow

Leachate collection flow simulation

$$Leach_i := \begin{| a \leftarrow Simul(i, HRain, A_{active}, Inf_{active}) \\ b \leftarrow Simul(i, HRain, A_{Stemp}, Inf_{Stemp}) \\ c \leftarrow Simul(i, HRain, A_{Ltemp}, Inf_{Ltemp}) \\ d \leftarrow Simul(i, HRain, A_{Gtemp}, Inf_{Gtemp}) \\ e \leftarrow Simul(i, HRain, A_{perm}, Inf_{perm}) \\ a + b + c + d + e + Bflow$$

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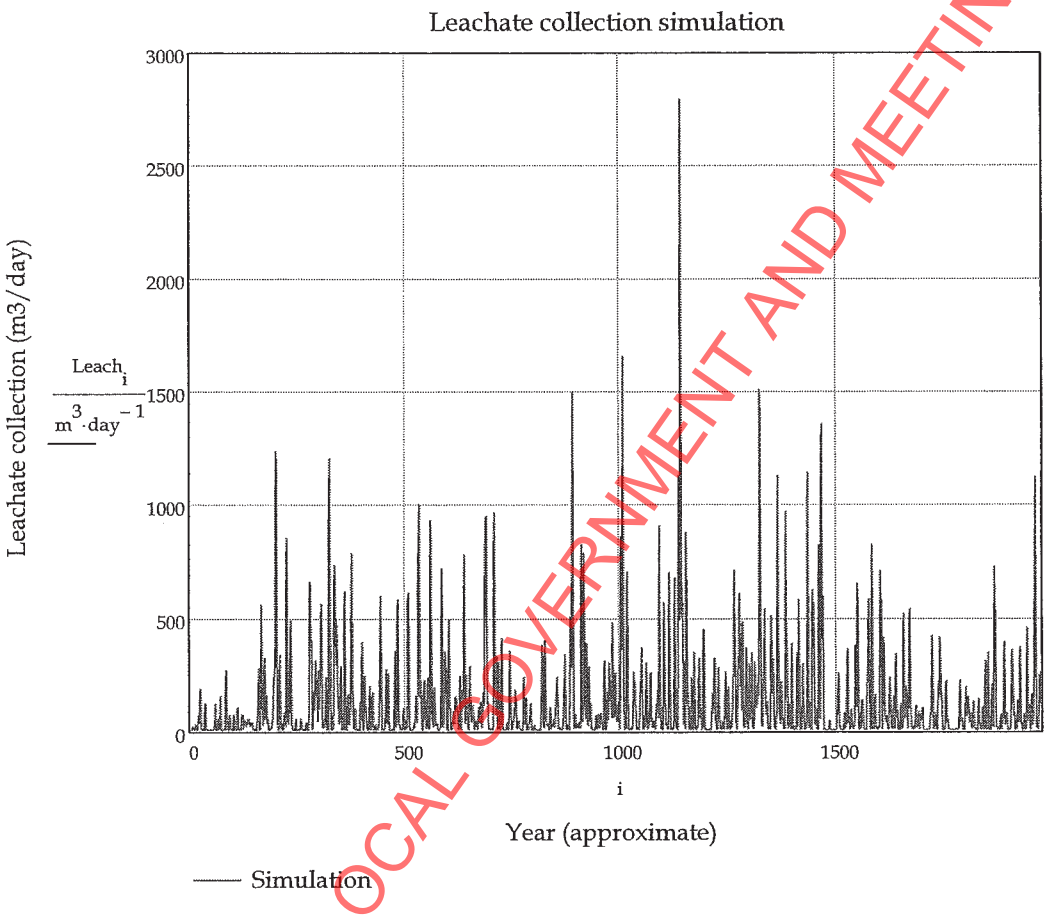
Results

Maximum predicted leachate collection $Max_{leach} := max(Leach)$ $Max_{leach} = 2796\,m^3 \cdot day^{-1}$

Average predicted leachate collection $Av_{leach} := mean(Leach)$ $Av_{leach} = 140\,m^3 \cdot day^{-1}$



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02d LANDFILL LEACHATE SIMULATION DAILY MODEL - BASE CASE 5% BASE FLOW

The contribution of a rainfall event on a particular day provides a response in the leachate collection systems that is dispersed over a number of days that follow. For many landfills, across a wide range of plan areas, this is about four days. The response is not an average across the four days, but has a peak before it diminishes towards the end of the period.

Units

$ha := 10^4 \cdot m^2$

Parameters

Cap type	Area of cap type	Proportion of rainfall that infiltrates cap type
Open active areas	$A_{active} := 1ha$	$Inf_{active} := 1$
Short term interim cover	$A_{Stemp} := 5ha$	$Inf_{Stemp} := 0.28$
Long term interim cover	$A_{Ltemp} := 16.2ha$	$Inf_{Ltemp} := 0.1$
Long term interim cover with geomembrane	$A_{Gtemp} := 0ha$	$Inf_{Gtemp} := 0.025$
Final cover system with geomembrane	$A_{perm} := 0ha$	$Inf_{perm} := 0.0001$
Waste intake for the landfill	$Intake := 140000 \cdot tonne \cdot yr^{-1}$	$Intake = 383\,tonne \cdot day^{-1}$
Degree of free water held in the delivered waste that contributes to leachate generation		$Waste_{free} := 5\%$
Base flow in the system is presumed to be constant	$Bflow := Intake \cdot \frac{m^3}{tonne} \cdot Waste_{free}$	$Bflow = 19.17\,m^3 \cdot day^{-1}$
The lag in the landfill waste and collection system before a rainfall event on a particular day has any measurable effect at the leachate collection system outlet.	There are short cut routes through the waste mass to the collection system and the lag is generally zero days	$lagSys := 0$ days
The time over which a rainfall event will contribute to the flow in the leachate collection system	This is generally only a few days, for an average landfill of a few hectares, or a landfill consisting of cells of <10 hectares this is in the order of 4 days. For a landfill of effectively one cell of about 60 hectares it can be 8 days.	$lagRain := 4$ days

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Rainfall records

A long-term prediction of the response of the landfill collection system is derived on the basis of a long-term rainfall pattern.

Record - 1 Jan 2001 to 31 May 2006.

Histrec :=

	0
0	0
1	0
2	0
3	0
4	0
5	0
6	0
7	1
8	0
9	0
10	0
11	0
12	0
13	1
14	0
15	1

Number of records $RecN := last(Histrec^{\langle 0 \rangle})$

Rainfall (mm) $HRain := Histrec^{\langle 0 \rangle} \cdot mm$

The simulation starts at the commencement date plus (lagRain+lagSys) days

$lagRain + lagSys = 4$

Counter $i := (lagRain + lagSys) .. RecN$

Landfill response characteristic

The following determines the contribution distribution throughout the lagRain period.

Not all the rainfall in the period of contribution to collection flows contributes equally to the leachate the collection flow on any given day.

"Char" is the estimated response characteristic for a small landfill. This is a combination of the generic response for active areas and for areas with temporary cover - these dominate the response due to their high infiltration rates.

Char :=

	0	1
0	0	0
1	1	0.29
2	2	0.36
3	3	0.35
4	4	0.32
5	5	0.27
6	6	0.19
7	7	0.1
8	8	0
9		

Total number of daily records

$Nchar := last(Char^{\langle 0 \rangle})$

Nchar = 8 days

Corrected periods for the length of the required characteristic $x1 := \frac{Char^{\langle 0 \rangle} \cdot lagRain}{Nchar}$

Proportion of rainfall contributing in a particular interval $y1 := Char^{\langle 1 \rangle}$

Function representing the proportion of rainfall allocated to each of the intervals $p := loess(x1, y1, 0.75)$

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Discount the values that are less than zero

$$prop1(d) := \begin{cases} num \leftarrow interp(p, x1, y1, d) \\ 0 \text{ if } num \le 0 \\ num \text{ otherwise} \end{cases}$$

Factor to determine the difference in total rainfall contribution over lagRain

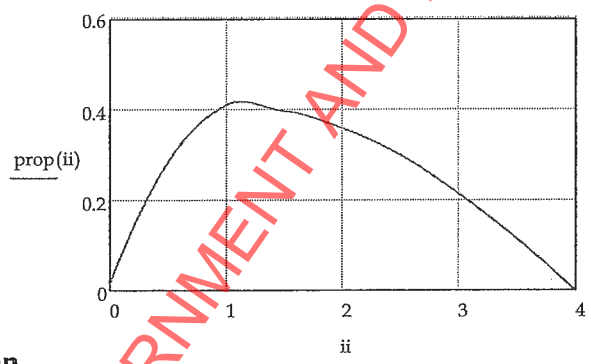
$$Factor := \sum_{i=0}^{lagRain} prop1(i) \qquad Factor = 0.892$$

Function for apportioning rainfall contribution on a daily basis

$$prop(d) := \frac{1}{Factor} \cdot prop1(d)$$

Check that the total rainfall contribution sums to unity

$$\sum_{i=0}^{lagRain} prop(i) = 1.000$$



Leachate collection flow function

The leachate on an particular day is the sum of the contributions from the rainfalls on all previous days from "lagRain+lagSys" to day "lagSys". The proportion of the each rainfall event is determined by "prop".

The relevant proportion "prop" has to be measured forwards from d - lagRain to i

$$Simul(d, R, A, I) := \begin{cases} bb \leftarrow \sum_{i=d-(lagRain+lagSys)}^{d-lagSys} \left(R_i \cdot prop(lagRain + i - d)\right) \\ bb \cdot A \cdot I \cdot day^{-1} \end{cases}$$

Leachate collection flow

Leachate collection flow simulation

$$Leach_i := \begin{cases} a \leftarrow Simul(i, HRain, A_{active}, Inf_{active}) \\ b \leftarrow Simul(i, HRain, A_{Stemp}, Inf_{Stemp}) \\ c \leftarrow Simul(i, HRain, A_{Ltemp}, Inf_{Ltemp}) \\ d \leftarrow Simul(i, HRain, A_{Gtemp}, Inf_{Gtemp}) \\ e \leftarrow Simul(i, HRain, A_{perm}, Inf_{perm}) \\ a + b + c + d + e + Bflow \end{cases}$$

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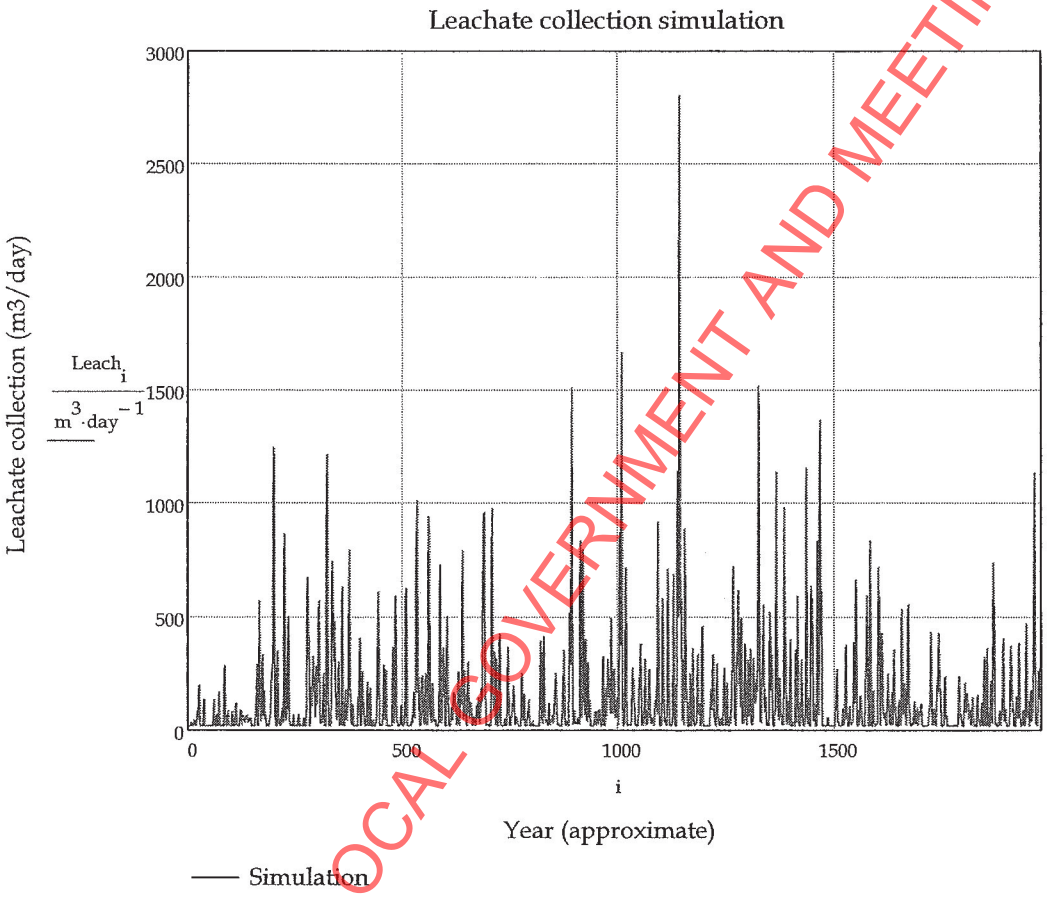
Results

Maximum predicted leachate collection $Max_{leach} := max(Leach)$ $Max_{leach} = 2805\,m^3 \cdot day^{-1}$

Average predicted leachate collection $Av_{leach} := mean(Leach)$ $Av_{leach} = 149\,m^3 \cdot day^{-1}$



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Appendix F Phase 1 & 2 leachate drainage design

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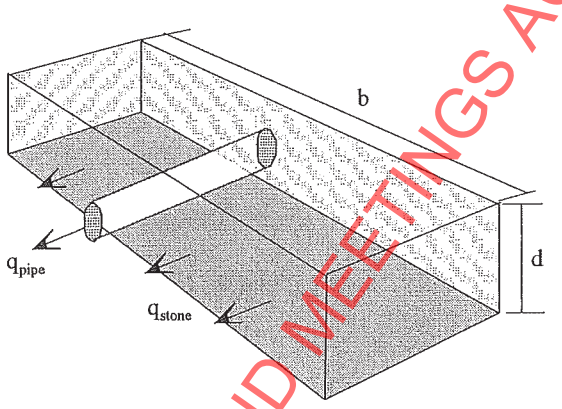
01 PHASE 1 & 2 LEACHATE DRAINAGE CAPACITY

The total flow capacity of the leachate collection layer is a combination of the flow in the granular media and the flow in the leachate header pipes.

The capacity of the leachate collection layer is estimated using Darcy's equation. Where the slope of the formation determines the hydraulic gradient of the flow.

The capacity of the leachate drains is estimated using the Colebrook-White equation.



Units

litre := $10^{-3}m^3$

Parameters

Gravel Drainage Layer

Permeability of drainage stone		$k_1 := 10^{-1}m \cdot s^{-1}$
Depth of drainage layer		$D_1 := 0.5m$
Average breadth of drainage layer at critical point		$B_1 := 30m$
Slope of drainage layer		$X_1 := 20$

Leachate pipe

Adopt the longterm condition of the pipe, it is likely to become slimed over the years of service.

Roughness coefficient in mm (slimed perforated HDPE pipe)		$k_s := 0.3mm$
Temperature of leachate		$t := 20$ °C
Diameter of leachate pipe	200 OD SDR11 HDPE pipe	$Dia_{Leach} := 0.200 \cdot m$
Slope of leachate pipe (1:X)		$X_2 := 20$

Design flow

Design leachate flow	Phase 1 & 2	$Q_{LeachDes} := 2800m^3 day^{-1}$ $Q_{LeachDes} = 32 litre \cdot s^{-1}$
	Stage 1/1A	$Q_{LeachStg1} := 30 litre \cdot s^{-1}$

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Equations

Flow rate in drainage pipes

Function for pipe full flow $q_{pipe}(x, D) :=$

$v \leftarrow \frac{40 \cdot 10^{-6} \cdot m^2 \cdot s^{-1}}{20 + t}$

Wetted Area $A \leftarrow \frac{\pi \cdot D^2}{4}$

Wetted Perimeter $P \leftarrow D \cdot \pi$

Hydraulic radius $R \leftarrow \frac{A}{P}$

Colebrook-White equation $v \leftarrow -\left(\sqrt{32 \cdot g \cdot R \cdot \frac{1}{x}} \cdot \log\left(\frac{k_s}{14.8 \cdot R} + \frac{1.255 \cdot v}{R \cdot \sqrt{32 \cdot g \cdot R \cdot \frac{1}{x}}}\right)\right)$

$A \cdot v$

Flow in the gravel drainage layer

Flow rate in m^3/day $q_{stone}(k, d, b, x) := k \cdot \frac{1}{x} \cdot d \cdot b$

Results

Pipe Capacity

Capacity of leachate pipe $q_{pipeLeach} := q_{pipe}(X_2, Dia_{Leach})$ $q_{pipeLeach} = 93.6\,litre \cdot s^{-1}$

Check1 := "Insufficient capacity in leachate pipe" if $q_{pipeLeach} < Q_{LeachDes}$
"Sufficient capacity in leachate pipe" otherwise

Check1 = "Sufficient capacity in leachate pipe"

Gravel drainage layer (worst case: pipe sheared)

Capacity of drainage stone $q_{stone1} := q_{stone}(k_1, D_1, B_1, X_1)$ $q_{stone1} = 75\,litre \cdot s^{-1}$

Check2 := "Insufficient capacity in gravel" if $q_{stone1} < Q_{LeachDes} + Q_{LeachStg1}$
"Sufficient capacity in gravel" otherwise

Check2 = "Sufficient capacity in gravel"

Total capacity of layer

$q_{total1} := q_{stone1} + q_{pipeLeach}$ $q_{total1} = 169\,litre \cdot s^{-1}$

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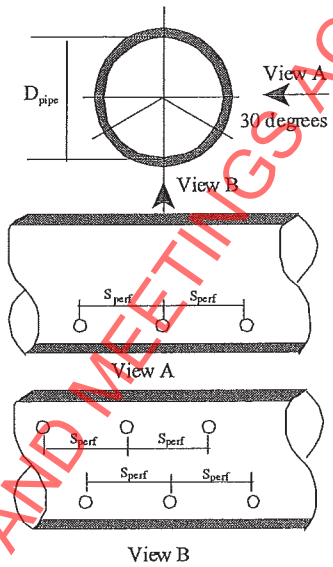
02 LEACHATE PIPE PERFORATION CAPACITY

The pipes are to collect the flow across a representative area.

The design constraint is that the flow level should not rise above the top of the collection layer.

The perforations are set at 1/3 of the depth of the collection layer above the base of the layer.

(See dwg 83091.400-FOR112)



Parameters

Design flow (based on maximum daily flow)	$Q := 2800m^3 \cdot day^{-1}$
Depth of collection layer	$D_l := 0.5m$
Length of pipe	$L_l := 220m$
Perforations diameter	$d_{perf} := 9mm$
Perforation spacing	$s_{perf} := 125mm$
Number of rows of perforations	$row_{num} := 3$
Orifice coefficient for sharp edge orifice	$C_d := 0.63$

Calculations

Flow per metre length of pipe: $Q_{permetre} := \frac{Q}{L_l}$ $Q_{permetre} = 1.473 \times 10^{-4} m^3 \cdot s^{-1} \cdot m^{-1}$

Area of perforation: $a := \frac{1}{4} \cdot \pi \cdot d_{perf}^2$ $a = 63.617\,mm^2$

Flow through each perforation: $q_{perf} := C_d \cdot a \cdot \sqrt{2 \cdot g \cdot \frac{2 \cdot D_l}{3}}$ $q_{perf} = 1.025 \times 10^{-4} m^3 \cdot s^{-1}$

Number of perforations per metre length: $N_{perf} := \frac{1m\, row_{num}}{s_{perf}} \cdot m^{-1}$ $N_{perf} = 24\,m^{-1}$

Capacity of perforations per metre length: $Q_{perf} := q_{perf} \cdot N_{perf}$ $Q_{perf} = 2.459 \times 10^{-3} m^3 \cdot s^{-1} \cdot m^{-}$

Check capacity of perforations:

$$Check1 := \begin{cases} \text{"Perforation capacity sufficient"} & \text{if } Q_{perf} > Q_{permetre} \\ \text{"Insufficient perforations"} & \text{otherwise} \end{cases}$$

Check1 = "Perforation capacity sufficient"

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03 HORIZONTAL PIPE STRENGTH

Suitable for use in the design of horizontal pipes buried at depth without particular support to the pipe structure. Generally used for the design of horizontal drainage pipes in HDPE.

Design approach:

- Calculate the external pressure on the pipe, this includes long-term loading and short term loading.
- Factor the external pressure to account for the difference between the perforated pipe surface and a solid wall pipe.
- Determine the factor of safety for wall crushing.
- Determine the Modulus of Elasticity for pipe material at the anticipated design life of the pipe taking account of the effects of compressive stress and temperature.
- Determine the factor of safety for wall buckling.
- Determine the factor of safety for wall deflection.

Parameters

Unit weight of soil (waste)		$\gamma_s := 14.0kN \cdot m^{-3}$
Maximum depth of soil		$d := 80m$
Soil Modulus (of surrounding material - crushed rock)		$E' := 100MPa$
Pipe SDR (standard dimension ratio)		$SDR := 11$
Compressive yield strength of pipe (Driscopipe 1500 psi)	$\sigma_a := 1500psi$	$\sigma_a = 10.342\,MPa$
Leachate temperature		$L_{temp} := 30$ °C
Pipe internal pressure (vacuum is negative) Leachate pipes operate at normal atmospheric pressure		$\Delta P_{int} := 0MPa$

Pressure on pipe

For deep burial the form of equations developed for incomplete projection should be used to determine the overburden pressure. This allows for the arching effect of materials across the pipe diameter.

Overburden pressure	$P_{oNIP} := d \cdot \gamma_s$	$P_{oNIP} = 1120\,kPa$
Based upon incomplete projection (refer to separate calculations)	From sheet 04	$P_{oIP} := 380kPa$
Total applied pressure	$P(P_o) := P_o - \Delta P_{int}$	$P(P_{oNIP}) = 1120\,kPa$ $P(P_{oIP}) = 380\,kPa$

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Correction for pipe perforations

If the leachate collection pipe is perforated, less cross sectional area of the pipe is carrying the applied external pressure than that which would be the case with a solid wall pipe. Therefore, a correction can be made to the external pressure to take account of the increase in stress in the pipe due to the perforations.

Perforation diameter $d_{perf} := 13mm$

Spacing of perforations $s_{perf} := 125mm$

Number of row of perforations $row_{num} := 3$

Effective length of perforations per unit length $L_p := d_{perf} \cdot row_{num} \cdot \frac{1m}{s_{perf}}$ $L_p = 0.312\,m$

Factored external pressure $P_F(P) := P \cdot \frac{1m}{1m - L_p}$ $P_F(P(P_{oNIP})) = 1628\,kPa$

$P_F(P(P_{oIP})) = 552\,kPa$

Wall crushing

Wall crushing theoretically occurs when the stress in a pipe wall, due to external vertical pressure, exceeds the long-term compressive strength of the pipe material. To ensure that the pipe wall is strong enough to endure the external pressure:

Compressive stress in pipe $\sigma_c(P) := \frac{SDR - 1}{2} \cdot P$ $\sigma_c(P_F(P(P_{oNIP}))) = 8.14\,MPa$

$\sigma_c(P_F(P(P_{oIP}))) = 2.762\,MPa$

Soil strain $\varepsilon_s(P) := \frac{P}{E'}$ $\varepsilon_s(P_F(P(P_{oNIP}))) = 0.016$

$\varepsilon_s(P_F(P(P_{oIP}))) = 5.523 \times 10^{-3}$

Factor of safety against wall crushing $FoS_{wc}(P) := \frac{\sigma_a}{\sigma_c(P)}$ $FoS_{wc}(P_F(P(P_{oNIP}))) = 1.271$

$FoS_{wc}(P_F(P(P_{oIP}))) = 3.745$

Most manufactures consider that a factor of safety of 1 is sufficient

$Check1 := \begin{cases} \text{"Crushing FoS OK"} & \text{if } FoS_{wc}(P_F(P(P_{oNIP}))) \geq 1 \\ \text{"Crushing not OK"} & \text{otherwise} \end{cases}$

$Check2 := \begin{cases} \text{"Crushing FoS OK"} & \text{if } FoS_{wc}(P_F(P(P_{oIP}))) \geq 1 \\ \text{"Crushing not OK"} & \text{otherwise} \end{cases}$

Without taking into account incomplete projection $Check1 = \text{"Crushing FoS OK"}$

Taking into account incomplete projection $Check2 = \text{"Crushing FoS OK"}$

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Modulus of Elasticity for pipe

Instantaneous modulus of elasticity at reference temperature of 23°C

$E_{I23} := EI(23)$

$E_{I23} = 901.774\,MPa$

Instantaneous modulus of elasticity at temperature of leachate

$E_{Itemp} := EI(L_{temp})$

$E_{Itemp} = 793.906\,MPa$

Design life 50 years

Elasticity to allow for compressive stress in pipe

$E_{stress}(p) := E50(\sigma_c(p))$

$E_{stress}(P_F(P(P_{oNIP}))) = 37\,MPa$

$E_{stress}(P_F(P(P_{oIP}))) = 149\,MPa$

Modulus of elasticity corrected for environmental conditions

$E_{penv}(P) := E_{stress}(P)\cdot\frac{E_{Itemp}}{E_{I23}}$

$E_{penv}(P_F(P(P_{oNIP}))) = 33\,MPa$

$E_{penv}(P_F(P(P_{oIP}))) = 132\,MPa$

Wall buckling

Local wall buckling is a longitudinal wrinkling of the pipe wall. tests of non-pressurised Driscopipe show that buckling and collapse do not occur where the soil envelope is in full contact with the pipe and is compacted to a dense state.

However, it can be forced to occur over the long-term in non-pressurised pipe if the total external soil pressure P_t is allowed to exceed the pipe-soil system's critical buckling pressure P_{cb}. If $P_t > P_{cb}$ gradual collapse may occur over the long term. A calculated, conservative value for the critical buckling pressure may be obtained by the following approximate formula. All pipe diameters with the same SDR in the same burial condition have the same critical collapse and critical buckling endurance.

Critical collapse differential pressure

$P_c(P) := \frac{2.32\cdot E_{penv}(P)}{SDR^3}$

$P_c(P_F(P(P_{oNIP}))) = 57\,kPa$

$P_c(P_F(P(P_{oIP}))) = 229\,kPa$

Critical Buckling pressure

$P_{cb}(P) := 0.8\cdot\sqrt{E'\cdot P_c(P)}$

$P_{cb}(P_F(P(P_{oNIP}))) = 2\,MPa$

$P_{cb}(P_F(P(P_{oIP}))) = 4\,MPa$

Factor of safety against wall buckling

$FoS_{wb}(P) := \frac{P_{cb}(P)}{P}$

$FoS_{wb}(P_F(P(P_{oNIP}))) = 1.174$

$FoS_{wb}(P_F(P(P_{oIP}))) = 6.935$

A minimum acceptable factor of safety of 1 is considered to be acceptable because of the conservativeness in the method

$Check3 := \begin{cases} \text{"Buckling OK"} & \text{if } FoS_{wb}(P_F(P(P_{oNIP}))) \geq 1 \\ \text{"Buckling not OK"} & \text{otherwise} \end{cases}$

$Check4 := \begin{cases} \text{"Buckling OK"} & \text{if } FoS_{wb}(P_F(P(P_{oIP}))) \geq 1 \\ \text{"Buckling not OK"} & \text{otherwise} \end{cases}$

Without taking into account incomplete projection

Check3 = "Buckling OK"

Taking into account incomplete projection

Check4 = "Buckling OK"

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Ring deflection

Ring deflection is defined as the ratio of the vertical change in diameter to the original diameter. It is often expressed as a percentage.

Ring deflection for buried HDPE pipe is conservatively assumed to be the same as the vertical compression of the soil envelope around the pipe. Design by ring deflection matches the ability of the HDPE pipe to accommodate, without structural distress, the vertical compression of the soil enveloping the buried pipe.

The allowable ring deflection of HDPE pipe is a function of the allowable tangential strain in the outer surface of the pipe wall.

A limit of 1% to 1.5% tangential strain in the outer surface of the pipe wall due to vertical deflection of the pipe by soil compression is generally assumed to be conservatively accepted by most HDPE pipe manufactures. The allowable vertical strain (ring deflection) of the pipe of 2% to 8% does not result in a significant loss of cross sectional area or flow capacity of the pipe, since the deformed pipe has a larger horizontal dimension than that of the original pipe, which compensates for the loss of the vertical dimension.

Therefore a factor of safety of 1 for ring deflection is generally considered to be acceptable.

Vertical strain in the soil envelope

$\varepsilon_s(P_F(P(P_{oNIP}))) = 1.63\ \%$

$\varepsilon_s(P_F(P(P_{oIP}))) = 0.55\ \%$

Tangential strain in the outer surface of the pipe

$\varepsilon_t(P) := \frac{\varepsilon_s(P)}{0.25 \cdot SDR}$

$\varepsilon_t(P_F(P(P_{oNIP}))) = 0.59\ \%$

$\varepsilon_t(P_F(P(P_{oIP}))) = 0.2\ \%$

Allowable vertical strain in the pipe (SDR 11)

$\varepsilon_{pallow} := 2.7\%$

Factor of safety on ring deflection

$FoS_{rd}(P) := \frac{\varepsilon_{pallow}}{\varepsilon_s(P)}$

$FoS_{rd}(P_F(P(P_{oNIP}))) = 1.659$

$FoS_{rd}(P_F(P(P_{oIP}))) = 4.888$

$Check5 := \begin{cases} \text{"Ring deflection OK"} & \text{if } FoS_{rd}(P_F(P(P_{oNIP}))) \geq 1 \\ \text{"Ring deflection not OK"} & \text{otherwise} \end{cases}$

$Check6 := \begin{cases} \text{"Ring deflection OK"} & \text{if } FoS_{rd}(P_F(P(P_{oIP}))) \geq 1 \\ \text{"Ring deflection not OK"} & \text{otherwise} \end{cases}$

Without taking into account incomplete projection

Check5 = "Ring deflection OK"

Taking into account incomplete projection

Check6 = "Ring deflection OK"

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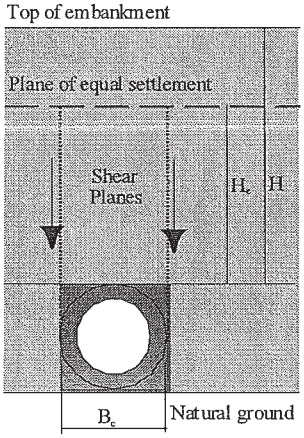
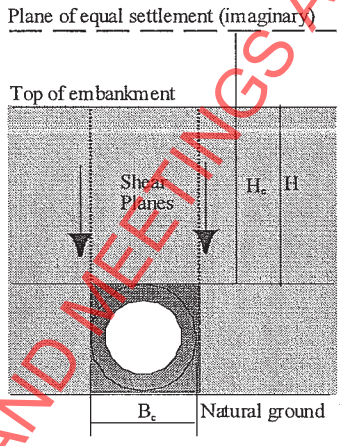
04 POSITIVE PROJECTION CONDITION (EMBANKMENT OR WIDE TRENCH) - LOAD ON PIPE

The pipe is material is generally much stiffer than the fill beside it. Therefore, frictional forces from downdrag at the sides add to the pipe load. When H is relatively small the frictional slip planes are assumed to extend to the surface and this is termed "complete projection".

When H is large, the vertical slip planes are considered to peter out at a level known as the "plane of equal settlement" situated a height H_e. This situation is termed the "incomplete projection" condition.



Incomplete projection condition



Complete projection condition

Reference

TRRL 1983 "A guide to design loadings for buried pipes"

Parameters

Unit weight of backfill (rockfill and waste) $\gamma := \frac{0.5 \cdot 20 + 79.5 \cdot 14}{80} \cdot kN \cdot m^{-3}$ $\gamma = 14.0\,kN \cdot m^{-3}$

Back fill soil characteristics: The parameter Kμ is a semi-empirical constant which is a combination of :

- K the Active earth pressure coefficient; and
- μ the coeffciient of sliding friction within a mass of fill

The maximum value is generally adopted because this gives the worst case.

Descritpion of backfill	Ku	
Granular materials without cohesion	0.19	
Sand and gravel	0.165	max
Saturated top soil	0.15	max
Clay	0.13	ordinary max
Saturated clay	0.11	max

$K\mu := 0.19$

The settlement ratio is regarded as a semi-empirical constant and is a function of the pipe installation. Although theoretically negative values of r_{sd} can occur they are unlikely.

Foundation condition	rsd	
	min	max
Pipe laid on unyeilding foundation (eg rock)	1	1
Pipe laid on normal foundation	0.5	0.8
Pipe laid ion yeilding foundation	0	0.5

$r_{sd} := 1$

Positive projection ratio is that proportion of the pipe's external diameter that is a above the firm bedding level or natural ground. $p := 1$

Pipe outside diameter 200 OD SDR11 HDPE pipe $B_c := 200mm$

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Ranges

Minimum depth of cover $H_{min} := 1m$

Maximum depth of cover $H_{max} := 100m$

Complete projection

Load on pipe

$$W_{c_Comp}(H) := \frac{e^{2\cdot\left(K\mu\cdot\frac{H}{B_c}\right)} - 1}{2\cdot K\mu}\cdot\gamma\cdot B_c^{\,2}$$

Transition depth

Function to find transition depth:

$$fHe(H_e, H) := \left| \begin{array}{l} aa \leftarrow \frac{e^{2\cdot K\mu\cdot\frac{H_e}{B_c}} - 1}{2\cdot K\mu}\cdot\left[\frac{1}{2\cdot K\mu} + \left(\frac{H}{B_c} - \frac{H_e}{B_c}\right) + \frac{r_{sd}\cdot p}{3}\right] \\ bb \leftarrow \frac{1}{2}\cdot\left(\frac{H_e}{B_c}\right)^2 \\ cc \leftarrow \frac{r_{sd}\cdot p}{3}\cdot\left(\frac{H}{B_c} - \frac{H_e}{B_c}\right)\cdot e^{2\cdot K\mu\cdot\frac{H_e}{B_c}} \\ dd \leftarrow \frac{H_e}{2\cdot K\mu\cdot B_c} \\ ee \leftarrow \frac{H\cdot H_e}{B_c^{\,2}} \\ ff \leftarrow r_{sd}\cdot p\cdot\frac{H}{B_c} \\ aa + bb + cc - dd - ee - ff \end{array} \right.$$

Transition depth

$$H_e(H) := \left| \begin{array}{l} he \leftarrow 0.1m \\ s \leftarrow root(fHe(he, H), he) \end{array} \right.$$

Incomplete projection

Load on pipe as a function Spangler's formula

$$W_{c_Incomp}(H) := \left| \begin{array}{l} h_e \leftarrow H_e(H) \\ \left[\frac{e^{2\cdot K\mu\cdot\frac{h_e}{B_c}} - 1}{2\cdot K\mu} + \left(\frac{H}{B_c} - \frac{h_e}{B_c}\right)\cdot e^{2\cdot K\mu\cdot\frac{h_e}{B_c}}\right]\cdot\gamma\cdot B_c^{\,2} \end{array} \right.$$

Combined Formulation

When H is greater than He, the situation is termed the incomplete projection condition.

$$W_c(H) := \left| \begin{array}{l} h_e \leftarrow H_e(H) \\ W_{c_Comp}(H) \quad \text{if } H < h_e \\ W_{c_Incomp}(H) \quad \text{otherwise} \end{array} \right.$$

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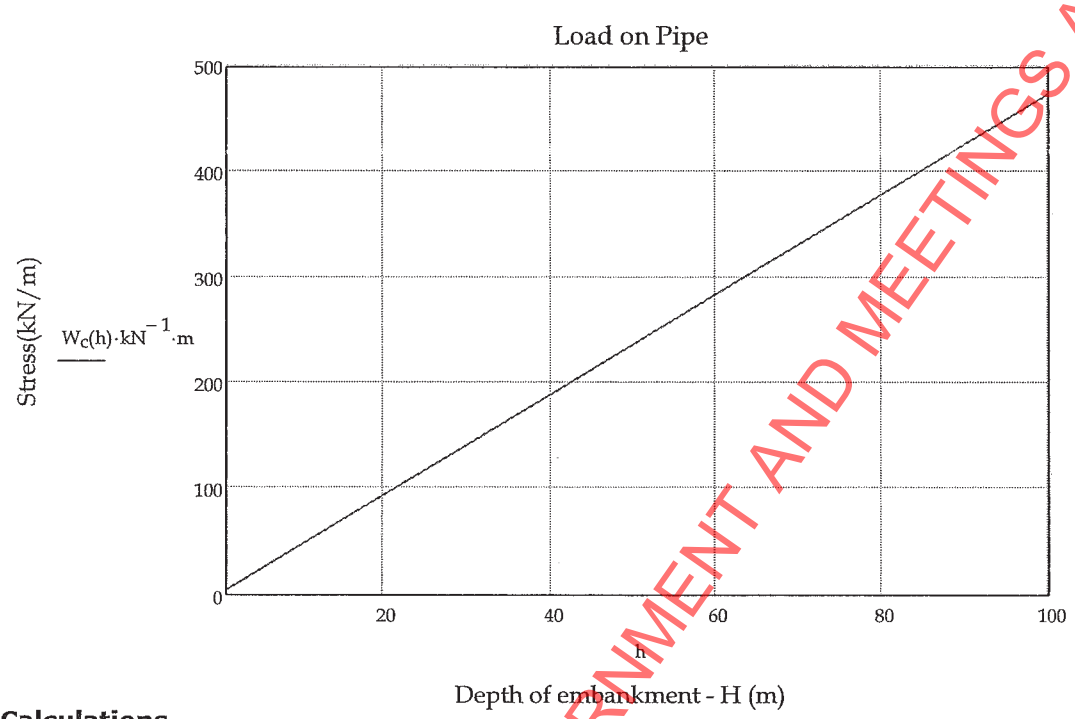
Results



Calculations

Depth h (m)	Transition depth H_e (m)	Stress on pipe (kN/m)
$h_1 := 5m$	$H_e(h_1) = 0.282\,m$	$W_c(h_1) = 23.68\,kN\cdot m^{-1}$
$h_2 := 80m$	$H_e(h_2) = 0.277\,m$	$W_c(h_2) = 379.8\,kN\cdot m^{-1}$

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Appendix G: Stability analysis

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Description: Silverstream Landfill - Stability assessment
Comments: Design Stability along Section 1 - Valley Axis
File Name: Section Line 1 - revised 06a.gsz
Last Saved Date: 20/06/2006
Analysis Method: Morgenstern-Price
Direction of Slip Movement: RightToLeft
Slip Surface Option: GridAndRadius
P.W.P. Option: PiezometricLine
Tension Crack Option: Angle
Seismic Coefficient: horz: 0, vert: 0

Material Properties

Material #: 1
Description: Phase 2 - Landfill
Model: MohrCoulomb
Wt: 14
Cohesion: 25
Phi: 35
Piezometric Line: 1

Material #: 2
Description: Phase 1 - Landfill
Model: MohrCoulomb
Wt: 14
Cohesion: 25
Phi: 35
Piezometric Line: 1

Material #: 3
Description: Liner B - (over existing L/F)
Model: MohrCoulomb
Wt: 19
Cohesion: 0
Phi: 10
Piezometric Line: 1

Material #: 4
Description: Liner A - (base of valley)
Model: MohrCoulomb
Wt: 19
Cohesion: 0
Phi: 26
Piezometric Line: 1

Material #: 5
Description: Existing Landfill
Model: Bedrock
Piezometric Line: 3

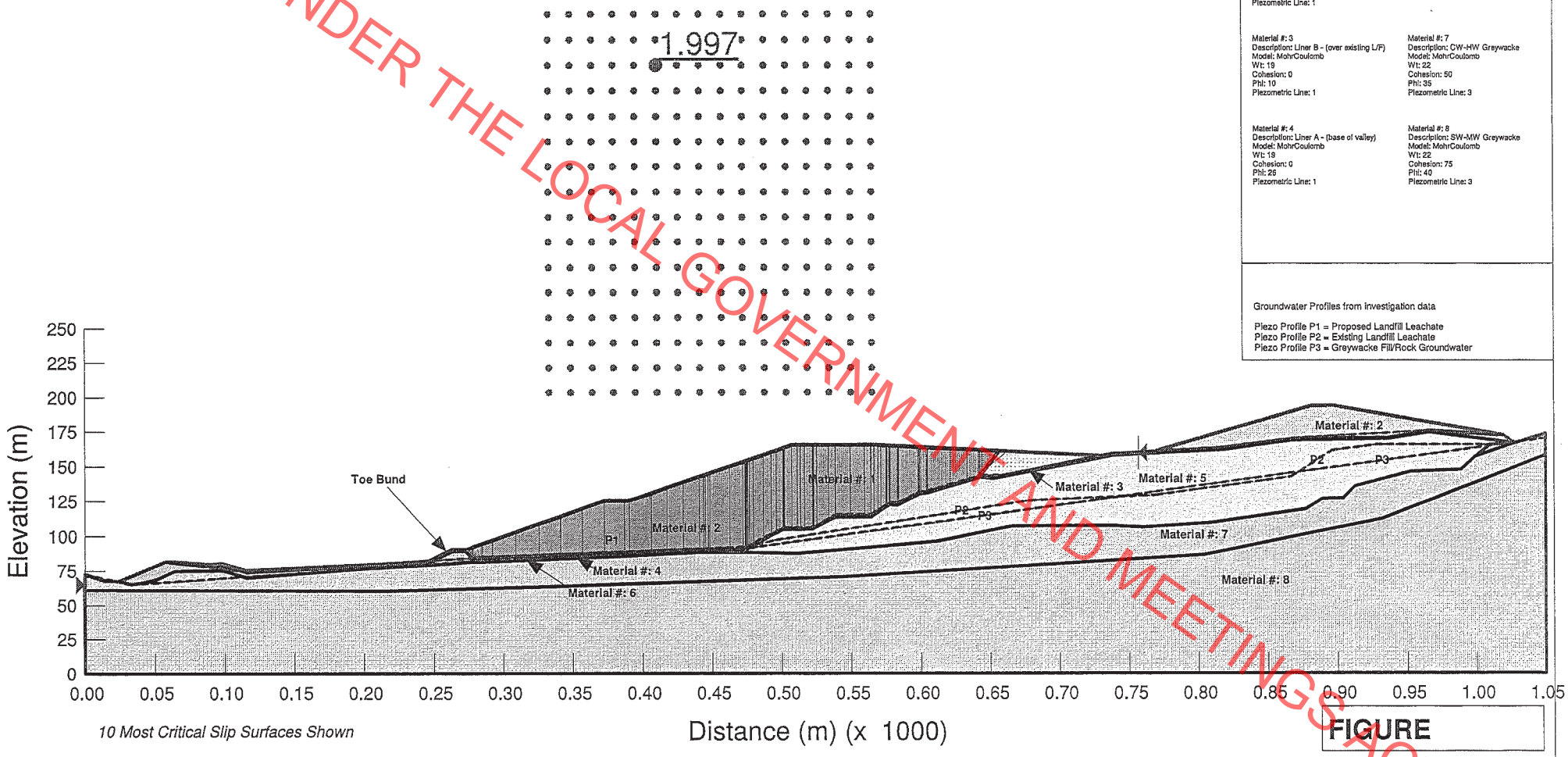
Material #: 6
Description: Greywacke Fill
Model: Bedrock
Piezometric Line: 2

Material #: 7
Description: CW-HW Greywacke
Model: MohrCoulomb
Wt: 22
Cohesion: 50
Phi: 35
Piezometric Line: 3

Material #: 8
Description: SW-MW Greywacke
Model: MohrCoulomb
Wt: 22
Cohesion: 75
Phi: 40
Piezometric Line: 3

Groundwater Profiles from investigation data

Piezo Profile P1 = Proposed Landfill Leachate
Piezo Profile P2 = Existing Landfill Leachate
Piezo Profile P3 = Greywacke Fill/Rock Groundwater



10 Most Critical Slip Surfaces Shown

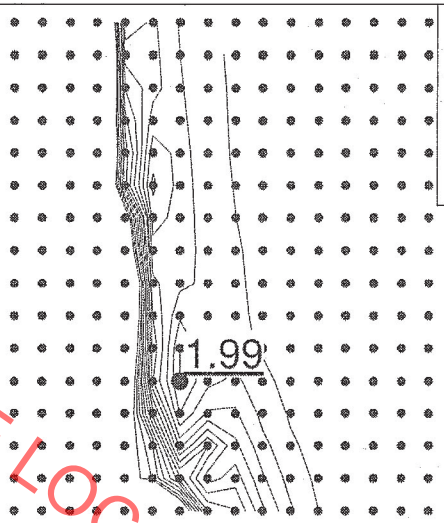
FIGURE

SILVERSTREAM LANDFILL STABILITY ASSESSMENT

DESIGN STAGE - Construction - End of Phase 2
FAILURE MODE - Liner System (Smooth HDPE/Geotextile Interface)
LINER CONFIGURATION - Drainage / Non-woven Geotextile / HDPE / Primary Liner
GROUNDWATER MODEL - Case A

T&T Job Reference 83091.402
Analysis by: JDJ/GRT
Scale 1:4000 @ A4

RELEASED UNDER THE LOCAL GOVERNMENT AND MEETINGS ACT 1987



Description: Silverstream Landfill - Stability assessment
Comments: Design Stability along Section 1 - Valley Axis
File Name: Section Line 1 - revised 06bundremoval.gsz
Last Saved Date: 19/10/2006
Analysis Method: Morgenstern-Price
Direction of Slip Movement: RightToLeft
Slip Surface Option: GridAndRadius
P.W.P. Option: PiezometricLine
Tension Crack Option: Angle
Seismic Coefficient: horz: 0

Material Properties

Material #: 1
Description: Phase 2 - Landfill
Model: MohrCoulomb
Wt: 14
Cohesion: 25
Phi: 35
Piezometric Line: 1

Material #: 2
Description: Phase 1 - Landfill
Model: MohrCoulomb
Wt: 14
Cohesion: 25
Phi: 35
Piezometric Line: 1

Material #: 3
Description: Liner B - (over existing L/F)
Model: MohrCoulomb
Wt: 19
Cohesion: 0
Phi: 10
Piezometric Line: 1

Material #: 4
Description: Liner A - (base of valley)
Model: MohrCoulomb
Wt: 19
Cohesion: 0
Phi: 26
Piezometric Line: 1

Material #: 5
Description: Existing Landfill
Model: Bedrock
Piezometric Line: 3

Material #: 6
Description: Greywacke Fill
Model: Bedrock
Piezometric Line: 2

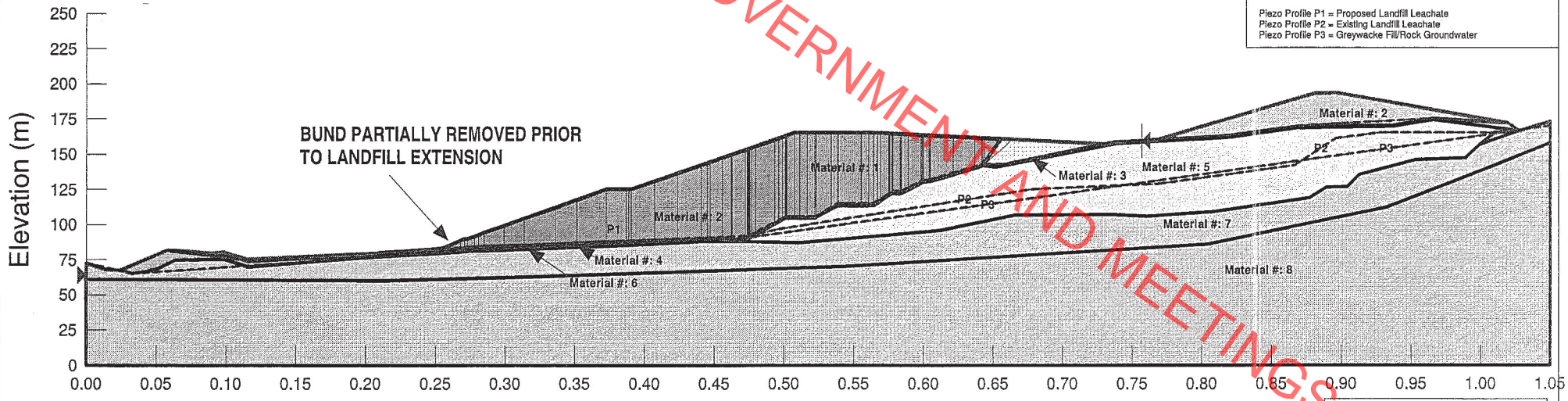
Material #: 7
Description: GW-HW Greywacke
Model: MohrCoulomb
Wt: 22
Cohesion: 50
Phi: 35
Piezometric Line: 3

Material #: 8
Description: SW-MW Greywacke
Model: MohrCoulomb
Wt: 22
Cohesion: 75
Phi: 40
Piezometric Line: 3

Material #: 10
Description: Bund
Model: MohrCoulomb
Wt: 19
Cohesion: 35
Phi: 10
Piezometric Line: 0

Groundwater Profiles from Investigation data

Piezo Profile P1 = Proposed Landfill Leachate
Piezo Profile P2 = Existing Landfill Leachate
Piezo Profile P3 = Greywacke Fill/Rock Groundwater



10 Most Critical Slip Surfaces Shown

FIGURE

SILVERSTREAM LANDFILL STABILITY ASSESSMENT

DESIGN STAGE - Bund removal prior to extension
FAILURE MODE - Liner System (Smooth HDPE/Geotextile Interface)
LINER CONFIGURATION - Drainage / Non-woven Geotextile / HDPE / Primary Liner
GROUNDWATER MODEL - Case A

T&T Job Reference 83091.402
Analysis by: JDJ/GRT
Scale 1:4000 @ A4

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Description: Silverstream Landfill - Stability assessment
Comments: Design Stability along Section 1 - Valley Axis
File Name: Section Line 1 - revised 06yeild.gsz
Last Saved Date: 20/06/2006
Analysis Method: Morgenstern-Price
Direction of Slip Movement: RightToLeft
Slip Surface Option: GridAndRadius
P.W.P. Option: PiezometricLine
Tension Crack Option: Angle
Seismic Coefficient: horz: 0.17,Range(Mean=0.17,Delta=1.e-002,Steps=5)

Material Properties

Material #: 1
Description: Phase 2 - Landfill
Model: MohrCoulomb
Wt: 14
Cohesion: 25
Phi: 35
Piezometric Line: 1

Material #: 2
Description: Phase 1 - Landfill
Model: MohrCoulomb
Wt: 14
Cohesion: 25
Phi: 35
Piezometric Line: 1

Material #: 3
Description: Liner B - (over existing L/F)
Model: MohrCoulomb
Wt: 19
Cohesion: 0
Phi: 10
Piezometric Line: 1

Material #: 4
Description: Liner A - (base of valley)
Model: MohrCoulomb
Wt: 19
Cohesion: 0
Phi: 26
Piezometric Line: 1

Material #: 5
Description: Existing Landfill
Model: Bedrock
Piezometric Line: 3

Material #: 6
Description: Greywacke Fill
Model: Bedrock
Piezometric Line: 2

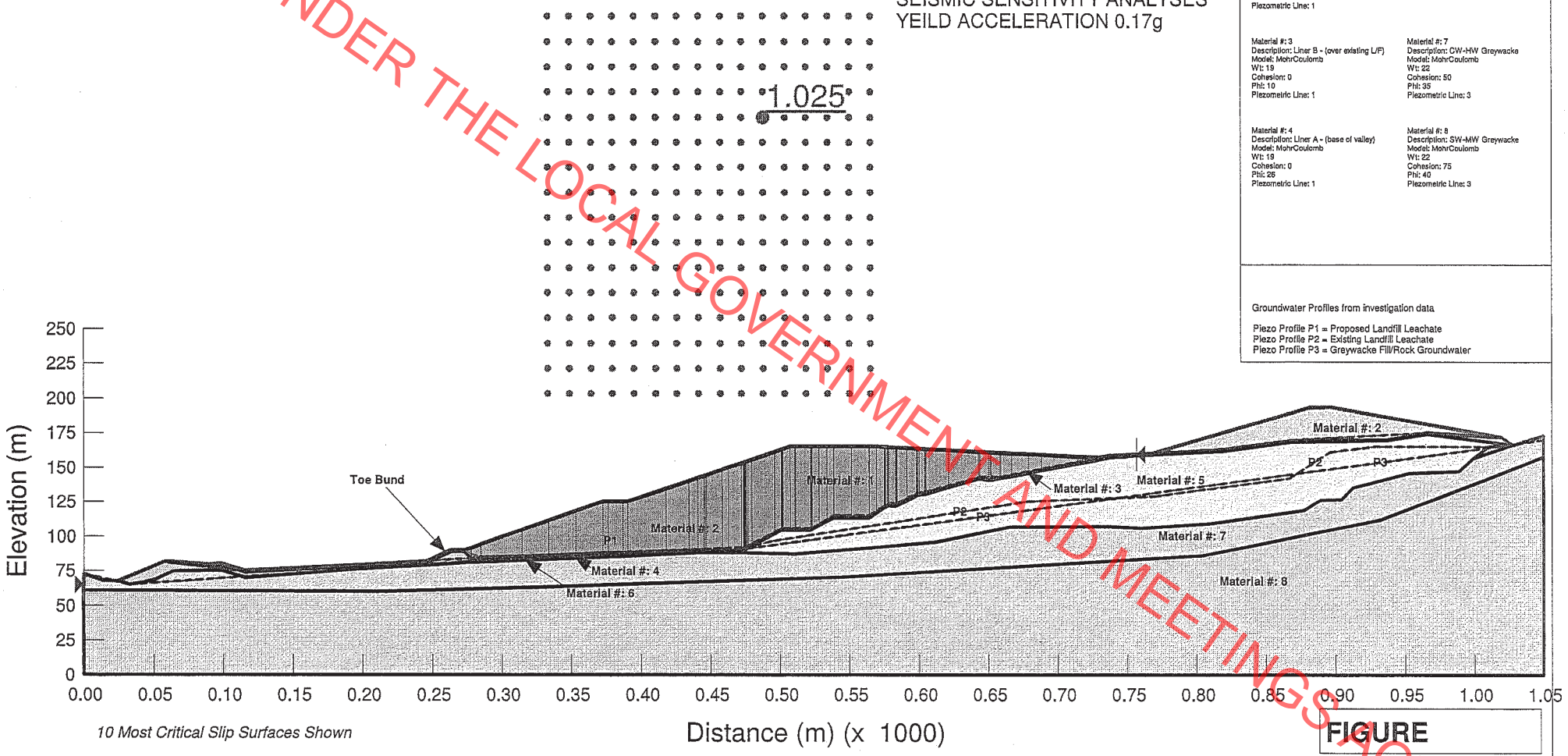
Material #: 7
Description: CW-HW Greywacke
Model: MohrCoulomb
Wt: 22
Cohesion: 50
Phi: 35
Piezometric Line: 3

Material #: 8
Description: SW-MW Greywacke
Model: MohrCoulomb
Wt: 22
Cohesion: 75
Phi: 40
Piezometric Line: 3

Groundwater Profiles from investigation data

Piezo Profile P1 = Proposed Landfill Leachate
Piezo Profile P2 = Existing Landfill Leachate
Piezo Profile P3 = Greywacke Fill/Rock Groundwater

SEISMIC SENSITIVITY ANALYSES
YEILD ACCELERATION 0.17g



10 Most Critical Slip Surfaces Shown

FIGURE

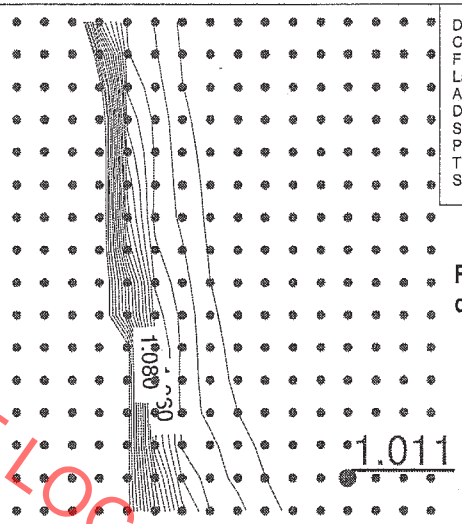
SILVERSTREAM LANDFILL STABILITY ASSESSMENT

DESIGN STAGE - Construction - End of Phase 2
FAILURE MODE - Liner System (Smooth HDPE/Geotextile Interface)
LINER CONFIGURATION - Drainage / Non-woven Geotextile / HDPE / Primary Liner
GROUNDWATER MODEL - Case A

T&T Job Reference 83091.402
Analysis by: JDJ/GRT
Scale 1:4000 @ A4

RELEASED UNDER THE LOCAL GOVERNMENT AND MEETINGS ACT 1987

Description: Silverstream Landfill - Stability assessment
Comments: Design Stability along Section 1 - Valley Axis
File Name: Section Line 1 - revised 06yeildbund50year.gsz
Last Saved Date: 12/10/2006
Analysis Method: Morgenstern-Price
Direction of Slip Movement: RightToLeft
Slip Surface Option: GridAndRadius
P.W.P. Option: PiezometricLine
Tension Crack Option: Angle
Seismic Coefficient: horz: 0.22



Failure surfaces exiting through or over the bund have higher FOS

SEISMIC SENSITIVITY ANALYSES
YEILD ACCELERATION 0.22g

Material Properties

Material #: 1
Description: Phase 2 - Landfill
Model: MohrCoulomb
Wt: 14
Cohesion: 25
Phi: 35
Piezometric Line: 1

Material #: 2
Description: Phase 1 - Landfill
Model: MohrCoulomb
Wt: 14
Cohesion: 25
Phi: 35
Piezometric Line: 1

Material #: 3
Description: Liner B - (over existing L/F)
Model: MohrCoulomb
Wt: 19
Cohesion: 0
Phi: 10
Piezometric Line: 1

Material #: 4
Description: Liner A - (base of valley)
Model: MohrCoulomb
Wt: 19
Cohesion: 0
Phi: 26
Piezometric Line: 1

Material #: 5
Description: Existing Landfill
Model: Bedrock
Piezometric Line: 3

Material #: 6
Description: Greywacke Fill
Model: Bedrock
Piezometric Line: 2

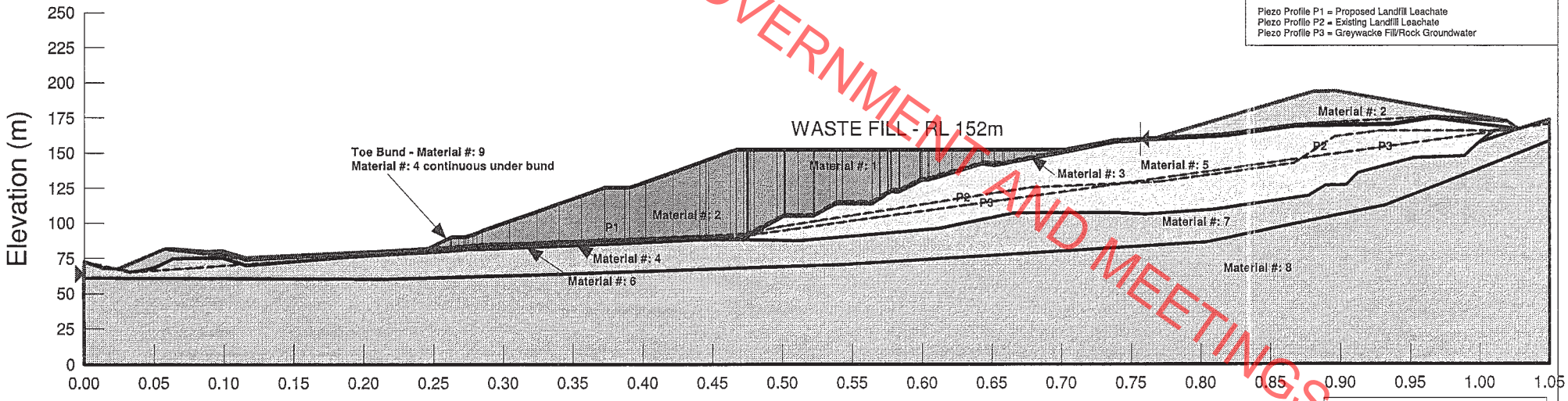
Material #: 7
Description: GW-HW Greywacke
Model: MohrCoulomb
Wt: 22
Cohesion: 50
Phi: 35
Piezometric Line: 3

Material #: 8
Description: SW-MW Greywacke
Model: MohrCoulomb
Wt: 22
Cohesion: 75
Phi: 40
Piezometric Line: 3

Material #: 10
Description: Bund
Model: MohrCoulomb
Wt: 19
Cohesion: 35
Phi: 10
Piezometric Line: 0

Groundwater Profiles from investigation data

Piezo Profile P1 = Proposed Landfill Leachate
Piezo Profile P2 = Existing Landfill Leachate
Piezo Profile P3 = Greywacke Fill/Rock Groundwater



10 Most Critical Slip Surfaces Shown

FIGURE

SILVERSTREAM LANDFILL STABILITY ASSESSMENT

DESIGN STAGE - Construction - End of Phase 2
FAILURE MODE - Liner System (Smooth HDPE/Geotextile Interface)
LINER CONFIGURATION - Drainage / Non-woven Geotextile / HDPE / Primary Liner
GROUNDWATER MODEL - Case A

T&T Job Reference 83091.402
Analysis by: JDJ/GRT
Scale 1:4000 @ A4

Appendix H: **Phase 1 Enabling works drawings – 83091.300**

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DRAWING LIST

Drawing Number	Revision	Title
General		
• 8309 1.300–GEN001	B	Drawing and Abbreviation List
• 8309 1.300–GEN002	B	Locality and Project Plan
Phase 1 Formation Works		
• 8309 1.300–FOR 101	B	Existing Levels
• 8309 1.300–FOR 102	B	Bulk Excavation Plan
• 8309 1.300–FOR 103	B	Formation Plan (HDPE Liner Level)
• 8309 1.300–FOR 104	B	Sections
• 8309 1.300–FOR 105	B	Groundwater Drainage Plan
• 8309 1.300–FOR 106	B	Groundwater Drainage Details (Sheet 1 of 2)
• 8309 1.300–FOR 107	B	Groundwater Drainage Details (Sheet 2 of 2)
Leachate Collection System		
• 8309 1.300–LCS401	B	Existing Leachate Collection System
• 8309 1.300–LCS402	B	Existing Leachate Line – Longsection
Western Perimeter Surface Water System		
• 8309 1.300–SUR523	B	Surface Water General Arrangement (Sheet 1 of 4)
• 8309 1.300–SUR524	B	Surface Water General Arrangement (Sheet 2 of 4)
• 8309 1.300–SUR525	B	Surface Water General Arrangement (Sheet 3 of 4)
• 8309 1.300–SUR526	B	Surface Water General Arrangement (Sheet 4 of 4)
• 8309 1.300–SUR527	B	Western Interim Drain Longsection (Sheet 1 of 2)
• 8309 1.300–SUR528	B	Western Interim Drain Longsection (Sheet 2 of 2)
• 8309 1.300–SUR529	B	Western Interim Drain Cross Sections (Sheet 1 of 6)
• 8309 1.300–SUR530	B	Western Interim Drain Cross Sections (Sheet 2 of 6)
• 8309 1.300–SUR531	B	Western Interim Drain Cross Sections (Sheet 3 of 6)
• 8309 1.300–SUR532	B	Western Interim Drain Cross Sections (Sheet 4 of 6)
• 8309 1.300–SUR533	B	Western Interim Drain Cross Sections (Sheet 5 of 6)
• 8309 1.300–SUR534	B	Western Interim Drain Cross Sections (Sheet 6 of 6)
• 8309 1.300–SUR535	B	Western Interim Drain Typical Cut Section
• 8309 1.300–SUR536	B	Western Interim Drain Typical Fill Section
• 8309 1.300–SUR537	B	Western Interim Drain Gully W1 Fill Details
• 8309 1.300–SUR538	C	Western Interim Drain Details (Sheet 1 of 3)
• 8309 1.300–SUR539	B	Western Interim Drain Details (Sheet 2 of 3)
• 8309 1.300–SUR540	B	Western Interim Drain Details (Sheet 3 of 3)
• 8309 1.300–SUR541	B	Western Interim Drain Outlet Details
• 8309 1.300–SUR542	B	Southern Interim Drain Longsection
• 8309 1.300–SUR543	B	Stage 1a Interim Drain Longsection
• 8309 1.300–SUR544	B	Southern Interim and Stage 1a Drain Details (Sheet 1 of 2)
• 8309 1.300–SUR545	B	Southern Interim and Stage 1a Drain Details (Sheet 2 of 2)
Survey Control		
• 8309 1.300–SET701	B	Existing Survey Control

• Denotes Drawing This Issue: 18 January 2005

ABBREVIATION LIST

RL	Reduced Level
RCRRJ	Reinforced Concrete Rubber Ring Joint
m	Metres
mm	Millimetres
IL	Invert Level
LL	Lid Level
Ex.	Existing
ND	Nominal Diameter
OD	Outside Diameter
LVC	Length of Vertical Curve
AP	All Passing
TNZ M4	Transit New Zealand Specification M4
HD	High Strength
EW	Each Way
EF	Each Face
crs	Centres
Dia, ø	Diameter
Rad	Radius

LEGEND

- Topsoil
- Existing Ground
- Select Backfill
- Clay
- AP40 TNZ M5 Basecourse
- Pipe Surround
- Pipe Bedding
- Asphalt
- Precast Concrete
- Armour
- Armour Filter
- North Direction
- Section/Elevation
- Setout Point
- 150 Major Contour
- Minor Contour
- Slope Vertical:Horizontal
- Top of Fill Batter
- Top of Cut Batter
- RL Reduced Level
- 1 2 Batter Slope
- Breakline
- Proposed Drain Centreline
- Existing Landfill Stream/Perimeter Drain
- Natural Water Course

REVISION	DESCRIPTION	BY	DATE
B	Construction Issue		11/06
A	Tender Issue		

DESIGNED : RGC Nov.05
DRAWN : NRM Nov.05
DESIGN CHECKED : 11/06
DRAFTING CHECKED : 11/06
CADFILE : L:\8309 1\300\8309 1.300–GEN001.dwg
APPROVED : 18/1/06
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HUTT CITY

SILVERSTREAM LANDFILL
SS2 Contract: AD 16–3559

TITLE
PHASE 1 ENABLING WORKS
Drawing and Abbreviation List

SCALES (AT A1 SIZE)

DWG. No. 8309 1.300–GEN001 REV. B

L:\8309\1\300\8309.1.300-GEN001.dwg, 001, 18/01/2006 12:02:07 p., rgc, b&w A3 laser.pc3, A3 (297 x 420 mm), 0.03937012

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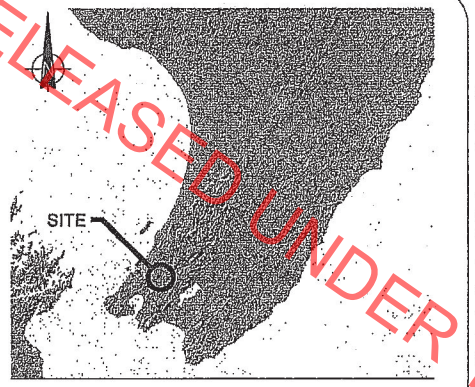
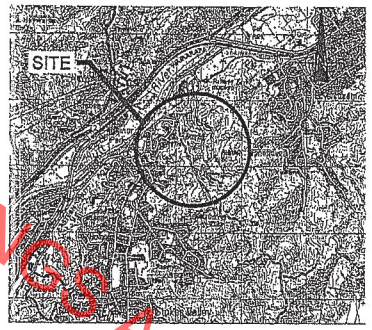


LOCATION PLAN (N.T.S.)

Eastern perimeter drain stockpiles
Stage 1 Landfill
Existing Domestic Drop off Facility
Extent of Site
Weigh Bridge
Southern Interim Drain
REYNOLDS BACH DRIVE
Power Station
Administration Building
Information Sign
Existing Silt Ponds
Base Preparation Works
Stage 1a Interim Drain
Extent Phase 1 Landfill
Existing Stage 1 Perimeter Drain
New Silt Ponds
Western Interim Drain

LEGEND
- Extent of Site
- Existing Major Contour
- Sealed Road
- Access Track
- Streams

A1 SCALE 1:2000
0 50 100 150 200 250 (m)



SITE LOCATION (N.T.S.)

REVISION	DESCRIPTION	BY	DATE
B	Construction Issue		1/06
A	Tender Issue		

DESIGNED : RGC Nov.05
DRAWN : NRM Nov.05
DESIGN CHECKED : 1/06
DRAFTING CHECKED : 1/06
CADFILE : L:\8309 1\300\8309 1.300-GEN002.dwg
APPROVED :
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NOTES :
1. All dimensions are in millimetres unless noted otherwise.
2. Existing ground contours created from Airborne Laser Scanning data flown 2 August 2005. Data provided by AAMHATCH Pty Ltd, Reference: 21011190 Inob.
3. Coordinates:
Coordinate Datum: NZ Geodetic 1949 Wellington Circuit Coordinates
Origin: Mt Cook 700,000 mN 300,000 mE
Level Datum: LINZ (MSL)

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SILVERSTREAM LANDFILL
SS2 Contract: AD 16-3559

TITLE
PHASE 1 ENABLING WORKS
Locality and Project Plan

SCALES (AT A1 SIZE) 1:2000
DWG. No. 8309 -GEN
REV. B

I:\8309\300\8309\300-GEN002.dwg, 002, 17/01/2006 2:56:11 p., rgc, b&w A3 laser.pc3, A3 (297 x 420 mm), 1:2

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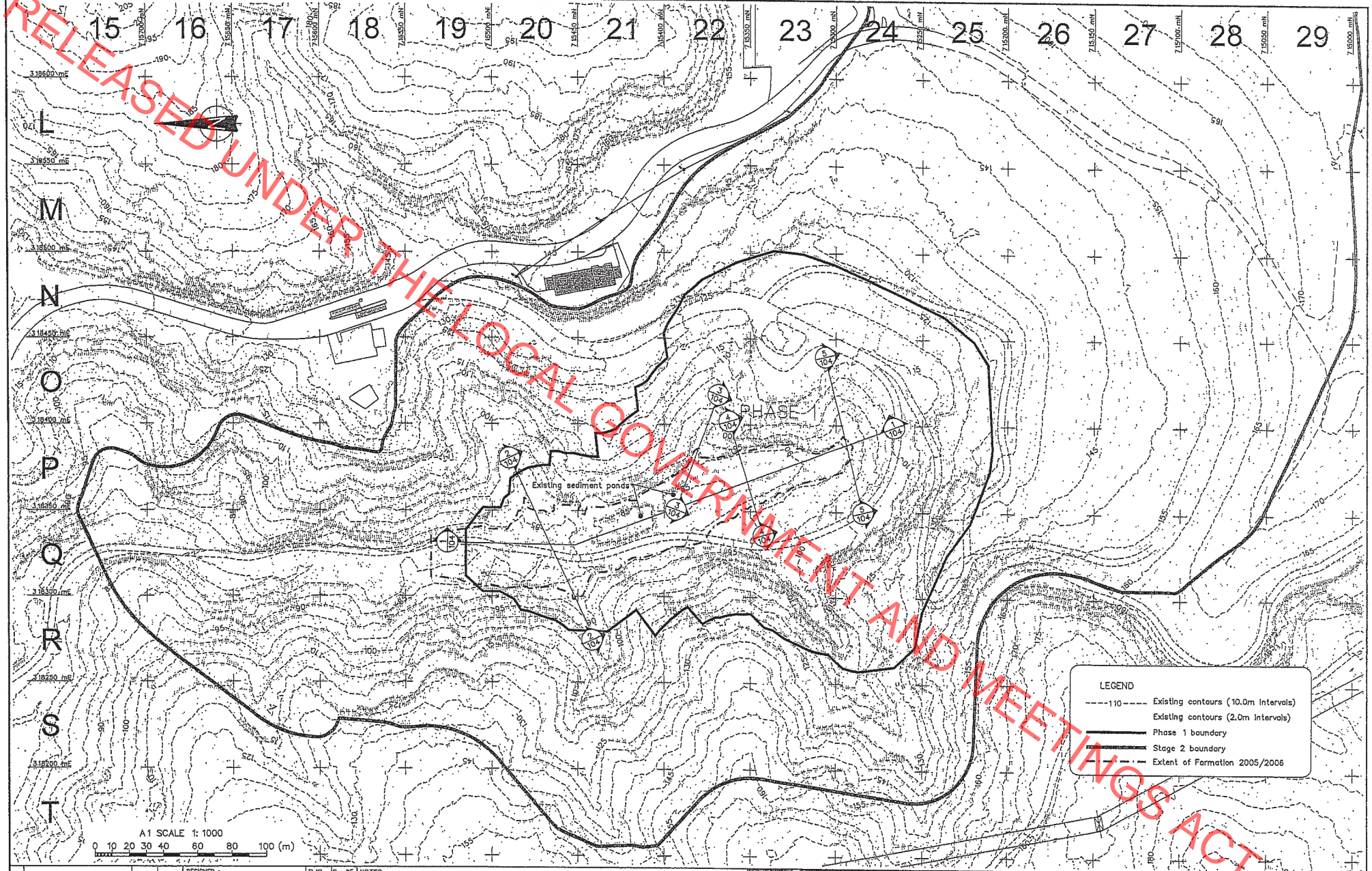

REVISION	DESCRIPTION	BY	DATE
B	Construction Issue		
A	Tender Issue		

DESIGNED : SJS Sep.05
DRAWN : RDB Sep.05
DESIGN CHECKED : 1/06
DRAFTING CHECKED : 1/06
CADFILE : L:\8309 1\..\8309 1.300-FOR 101
APPROVED : 12/1/06

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NOTES :
1. Coordinate Datum: NZ Geodetic 1949 Wellington Circuit
Coordinates Origin: Mt Cook 700,000 mN 300,000 mE
Level Datum: LINZ (MSL) Wellington Vertical Datum 1953
2. Existing ground contours created from Airborne Laser Scanning data flown 2 August 2005. Data provided by AAMHATCH Pty Ltd, Reference: 21011190 1nab.

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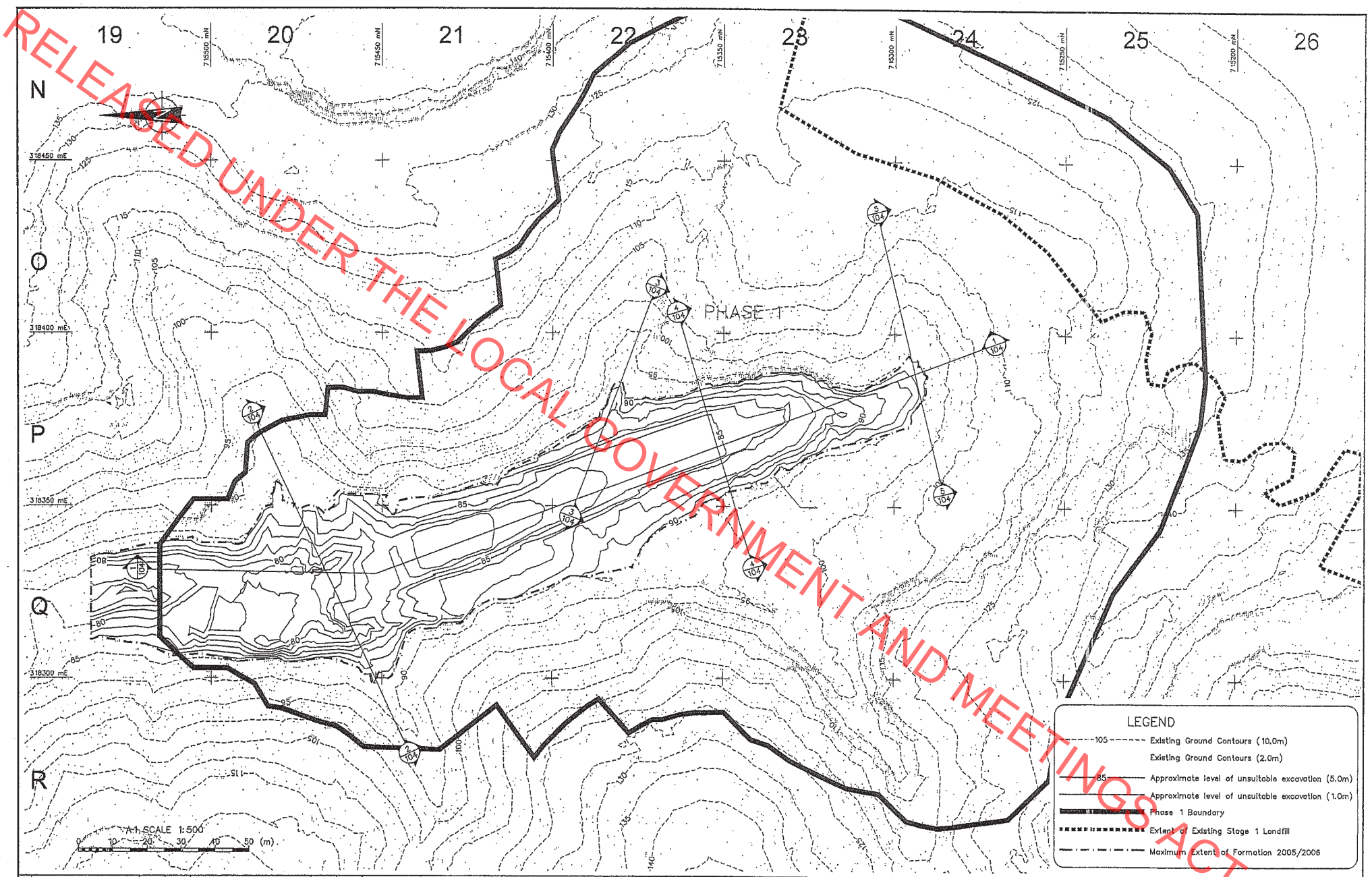
TITLE
PHASE 1 FORMATION WORKS
Existing Contour Plan and Extent of Works

SCALES (AT A1 SIZE) 1: 1000
DWG. No. 8309 1.300-FOR 101
REV. B

L:\8309\8309\1300-FOR101.dwg, 101, 17/01/2006 2:56:40 p., rgc, b&w A3 laser.pc3, A3 (297 x 420 mm), 1:2



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			DESIGNED :	SJS	Sep.05
			DRAWN :	RDB	Sep.05
			DESIGN CHECKED :		
			DRAFTING CHECKED :		
			CADFILE : L:\8309 1\..\8309 1.300-FOR 102		
B	Construction Issue		APPROVED :		
A	Tender Issue		This drawing is not to be used for construction purposes unless signed as approved		
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NOTES :
1. Coordinate Datum: NZ Geodetic 1949 Wellington Circuit
Coordinates Origin: Mt Cook 700,000 mN 300,000 mE
Level Datum: LINZ (MSL) Wellington Vertical Datum 1953
2. Existing ground contours created from Airborne Laser Scanning data flown 2 August 2005. Data provided by AAMHATCH Pty Ltd, Reference: 21011190 1nob.

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SS2 Contract: AD 16 3559

TITLE
PHASE 1 FORMATION WORKS
Bulk Excavation Plan

SCALES (AT A1 SIZE) 1:500
DWG. No. 8309 1.300-FOR 102
REV. B

L:\8309\1\300\83091_300-FOR102.dwg, 102, 17/01/2006 2:56:54 p., tgc, b&w A3 laser.pc3, A3 (297 x 420 mm), 1:2

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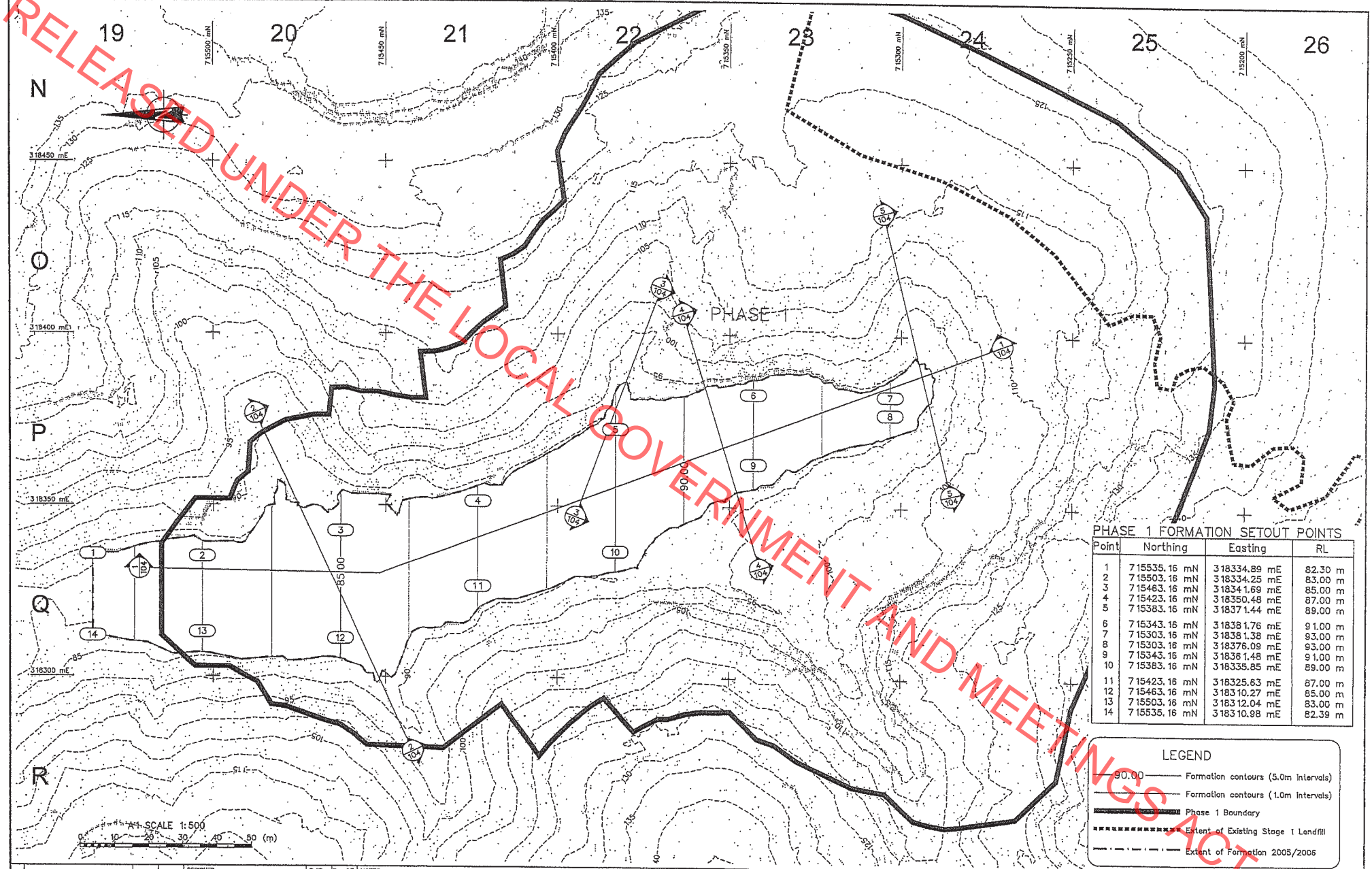

PHASE 1 FORMATION SETOUT POINTS

Point	Northing	Easting	RL
1	7 15535.16 mN	3 18334.89 mE	82.30 m
2	7 15503.16 mN	3 18334.25 mE	83.00 m
3	7 15463.16 mN	3 18341.69 mE	85.00 m
4	7 15423.16 mN	3 18350.48 mE	87.00 m
5	7 15383.16 mN	3 18371.44 mE	89.00 m
6	7 15343.16 mN	3 18381.76 mE	91.00 m
7	7 15303.16 mN	3 18381.38 mE	93.00 m
8	7 15303.16 mN	3 18376.09 mE	93.00 m
9	7 15343.16 mN	3 18361.48 mE	91.00 m
10	7 15383.16 mN	3 18335.85 mE	89.00 m
11	7 15423.16 mN	3 18325.63 mE	87.00 m
12	7 15463.16 mN	3 18310.27 mE	85.00 m
13	7 15503.16 mN	3 18312.04 mE	83.00 m
14	7 15535.16 mN	3 18310.98 mE	82.39 m

LEGEND

- 90.00 — Formation contours (5.0m intervals)
- Formation contours (1.0m intervals)
- Phase 1 Boundary
- Extent of Existing Stage 1 Landfill
- Extent of Formation 2005/2006

REVISION	DESCRIPTION	BY	DATE
B	Construction Issue		
A	Tender Issue		

DESIGNED : SJS Sep.05
DRAWN : RDB Sep.05
DESIGN CHECKED : 1/06
DRAFTING CHECKED : 1/06
CADFILE : L:\8309 1\...\8309 1.300-FOR 102
APPROVED : 17/1/06

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NOTES :
1. Coordinate Datum: NZ Geodetic 1949 Wellington Circuit
Coordinates Origin: Mt Cook 700,000 mN 300,000 mE
Level Datum: LINZ (MSL) Wellington Vertical Datum 1953
2. Existing ground contours created from Airborne Laser Scanning data flown 2 August 2005. Data provided by AAMHATCH Pty Ltd, Reference: 2 10 11 190 Inob.

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SS2 Contract: AD 16 3559

TITLE
PHASE 1 FORMATION WORKS
Formation Plan

SCALES (AT A1 SIZE) 1:500
DWG. No. 8309 1.300-FOR 103
REV. B

L:\8309\1\300\8309_300-FOR103.dwg, 103, 17/01/2006 2:59:10 p., tpc, b&w A3 laser.pc3, A3 (297 x 420 mm), 1:2

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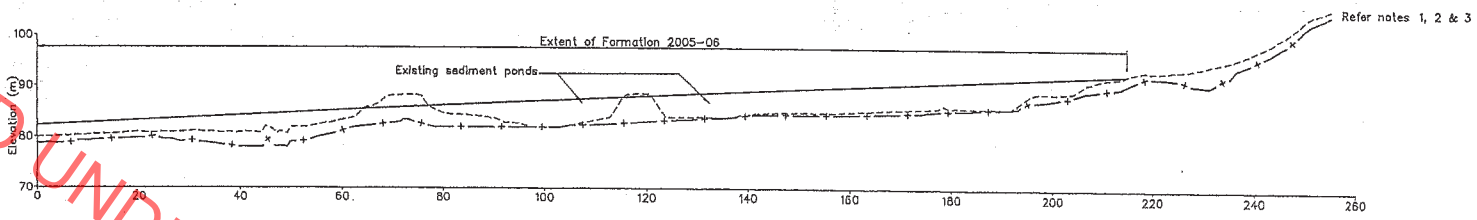
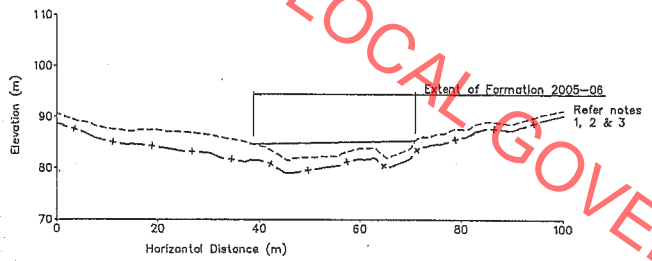
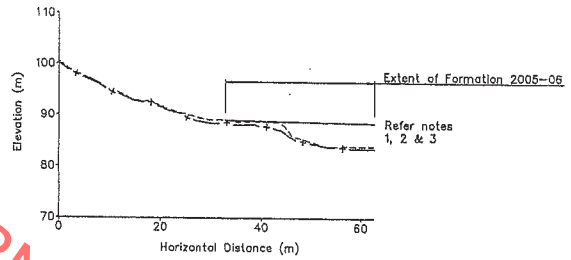


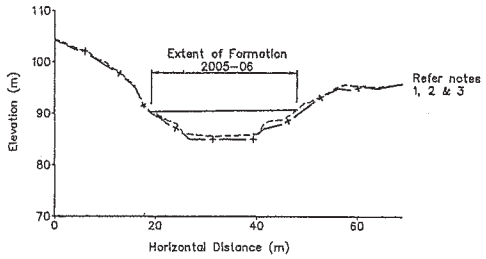
SECTION 1/102
SCALE 1:500



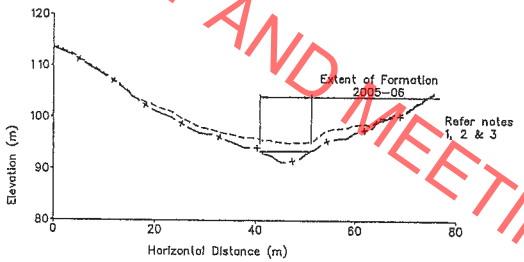
SECTION 2/102
SCALE 1:500



SECTION 3/102
SCALE 1:500



SECTION 4/102
SCALE 1:500



SECTION 5/102
SCALE 1:500

A1 SCALE 1:500
0 10 20 30 40 50 (m)

LEGEND
- Existing Ground
- Formation Level
- Estimated base of Unsuitables

REVISION DESCRIPTION	BY	DATE
B Construction Issue		
A Tender Issue		

DESIGNED : SJS Sep.05
DRAWN : RDB Sep.05
DESIGN CHECKED :
DRAFTING CHECKED :
CADFILE : L:\8309\1\300\Drawings\
APPROVED :

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REFERENCE :

NOTES :
1. Depth of unsuitables to be excavated is to be confirmed on site by the Engineer.
2. Depth of unsuitables shown in sediment ponds is indicative only.
3. For groundwater drainage details refer to drawings FOR 105 and FOR 106

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SS2 Contract: AD 16 3559

TITLE
PHASE 1 FORMATION WORKS
Sections

SCALES (AT A1 SIZE) 1:500
DWG. No. 8309 -FOR
REV. B

L:\8309\1\300\8309_300-FOR104.dwg, 104, 17/01/2006 2:59:21 p., rgc, b&w A3 laser.pc3, A3 (297 x 420 mm), 1:2

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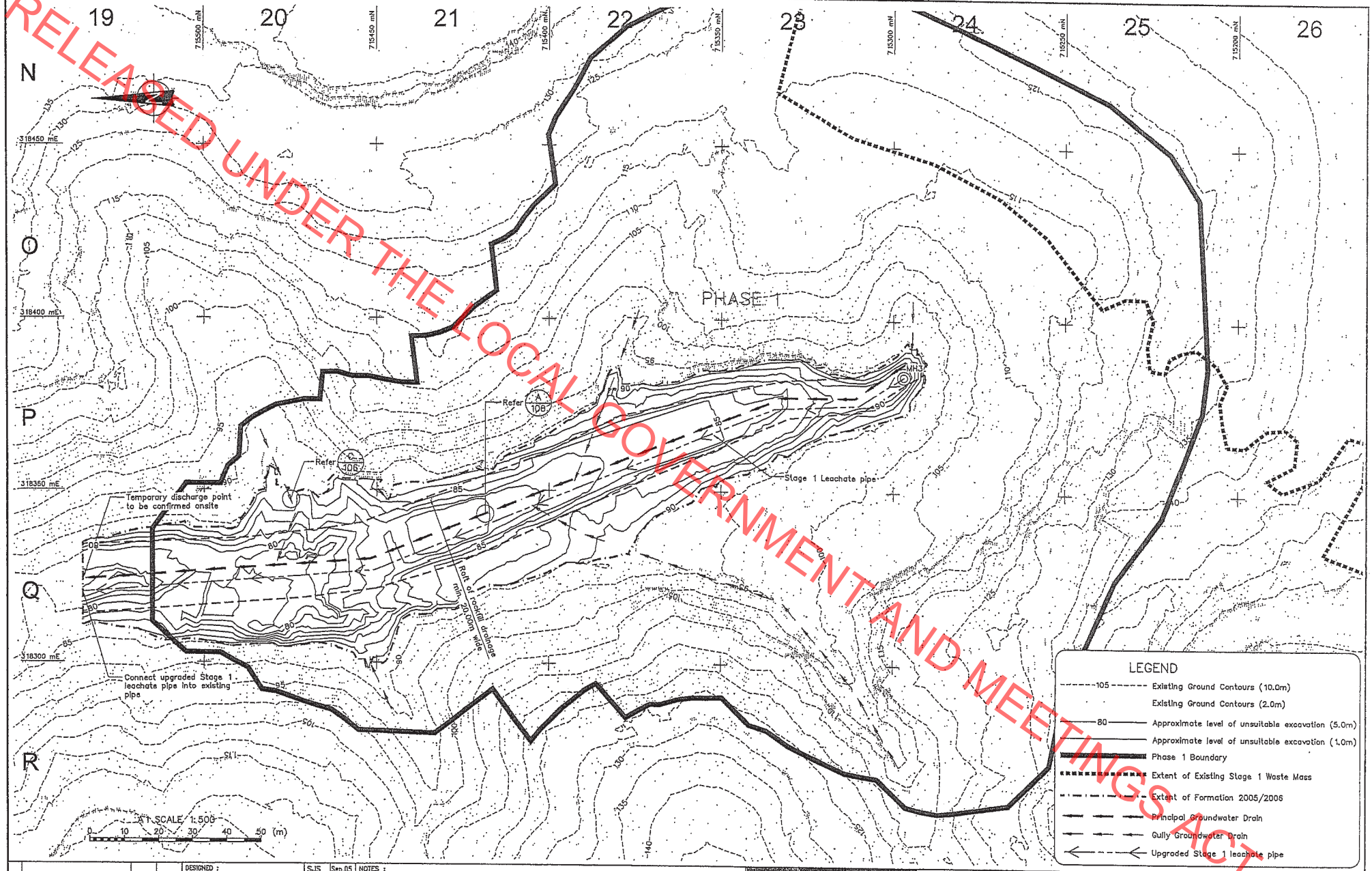

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DRAWN :	RDB	Sep.05	
DESIGN CHECKED :			
DRAFTING CHECKED :			
CADFILE : L:\8309 1\300\Drawings\			
APPROVED			

REVISION	DESCRIPTION	BY	DATE
B	Construction Issue		1/06
A	Tender Issue		

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NOTES :
1. Coordinate Datum: NZ Geodetic 1949 Wellington Circuit Coordinates
Origin: Mt Cook 700,000 mN 300,000 mE
Level Datum: LINZ (MSL) Auckland Vertical Datum 1946

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SILVERSTREAM LANDFILL
SS2 Contract: AD 16 3559

TITLE
PHASE 1 FORMATION WORKS
Groundwater Drainage Plan

SCALES (AT A1 SIZE) 1:500
DWG. No. 8309 1.300-FOR 105
REV. B

I:\8309\1\300\8309T300-FOR105.dwg, 105, 17/01/2006 2:59:30 p., Tgc, b&w A3 laser.pc3, A3 (297 X 420 mm), 1:2

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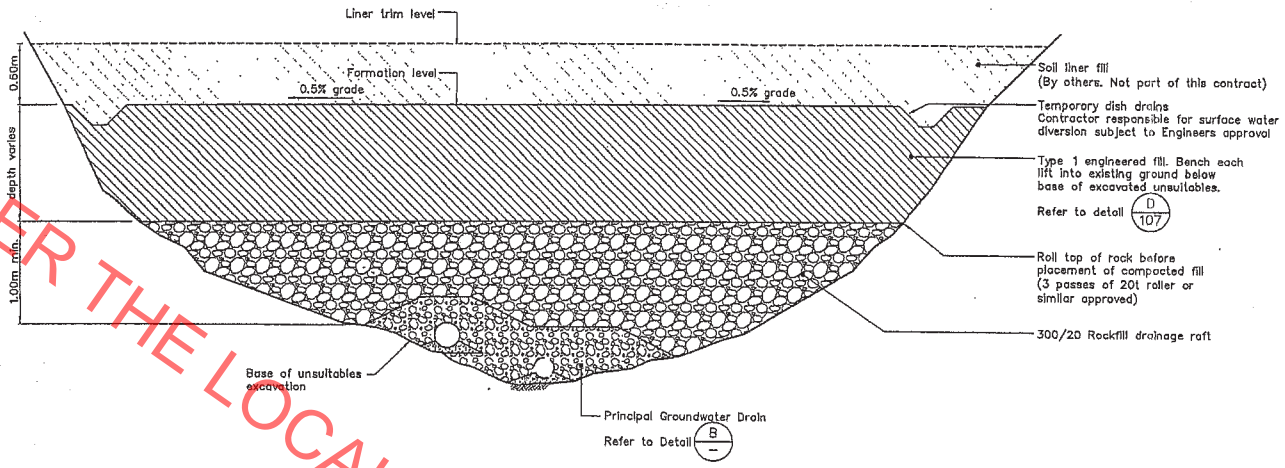
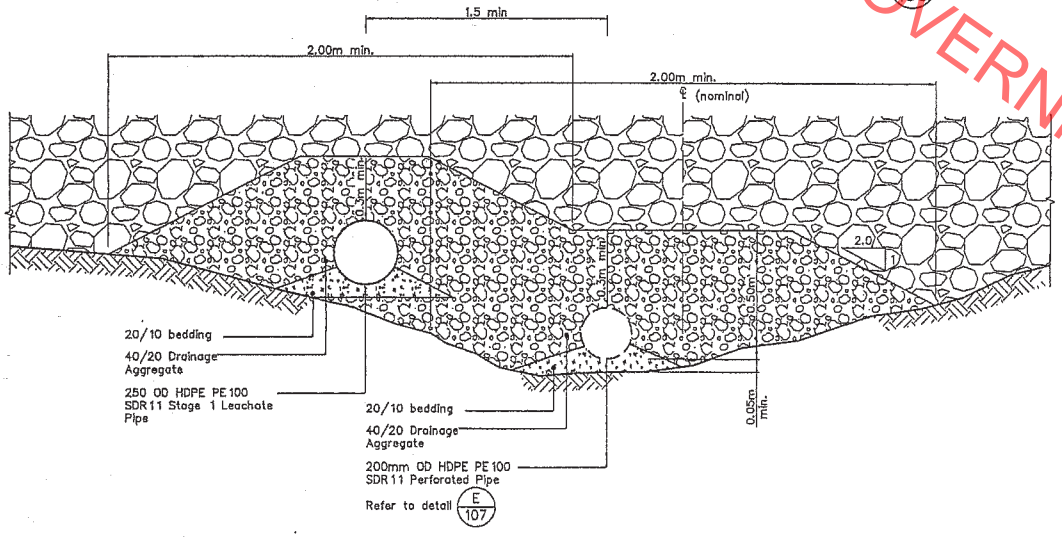
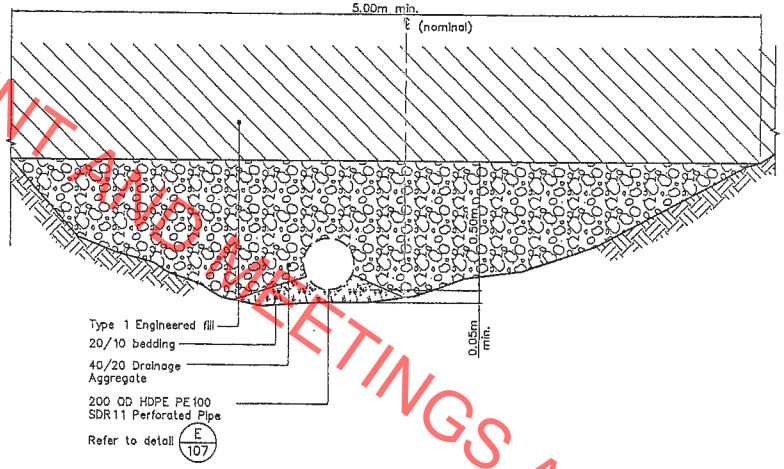


DETAIL A 105 SCALE 1:25 FILL FORMATION (Typical Section)



DETAIL B — SCALE 1:10 PRINCIPAL GROUNDWATER DRAIN



DETAIL C 105 SCALE 1:10 GULLY GROUNDWATER DRAIN

REVISION	DESCRIPTION	BY	DATE
C	Construction Issue		1/06
B	Leachate Pipe Added		
A	Tender Issue		

DESIGNED : SJS Sep.05
DRAWN : RDB Sep.05
DESIGN CHECKED : 1/06
DRAFTING CHECKED : 1/06
CADFILE : L:\8309 1\300\Drawings\
APPROVED : 17/1/06
This drawing is not to be used for construction purposes unless signed as approved
COPYRIGHT ON THIS DRAWING IS RESERVED
REFERENCE :

NOTES :
1. All dimensions are in millimetres unless noted otherwise.
2. Rockfill material grading to be determined based on achievable grading of onsite material.
3. For termination details refer to Detail F of drawing FOR 107
4. 40/20 drainage aggregate to be well rounded

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TITLE
SILVERSTREAM LANDFILL
SS2 Contract: AD 16 3559
PHASE 1 FORMATION WORKS
Groundwater Drainage Details – Sheet 1 of 2

SCALES (AT A1 SIZE) SHOWN
DWG. No. 8309 -FOR
REV. C

K:\8309\1\300\8309_300-FOR106_107.dwg, 106, 17/01/2006 2:59:42 p., rgo, b&w A3 laser.pc3, A3 (297 x 420 mm), 1:2

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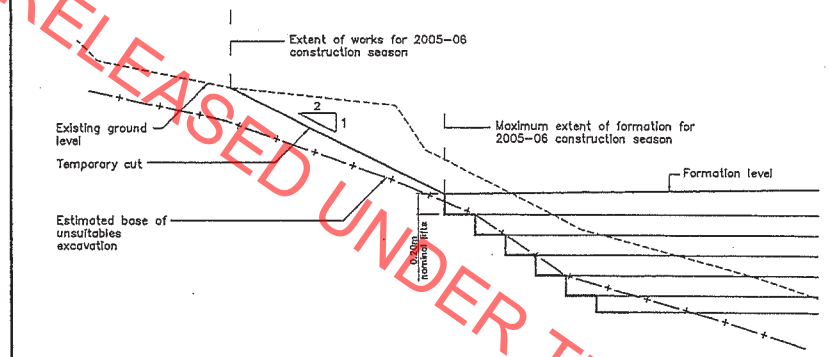
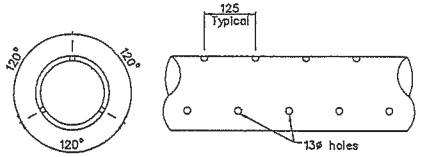
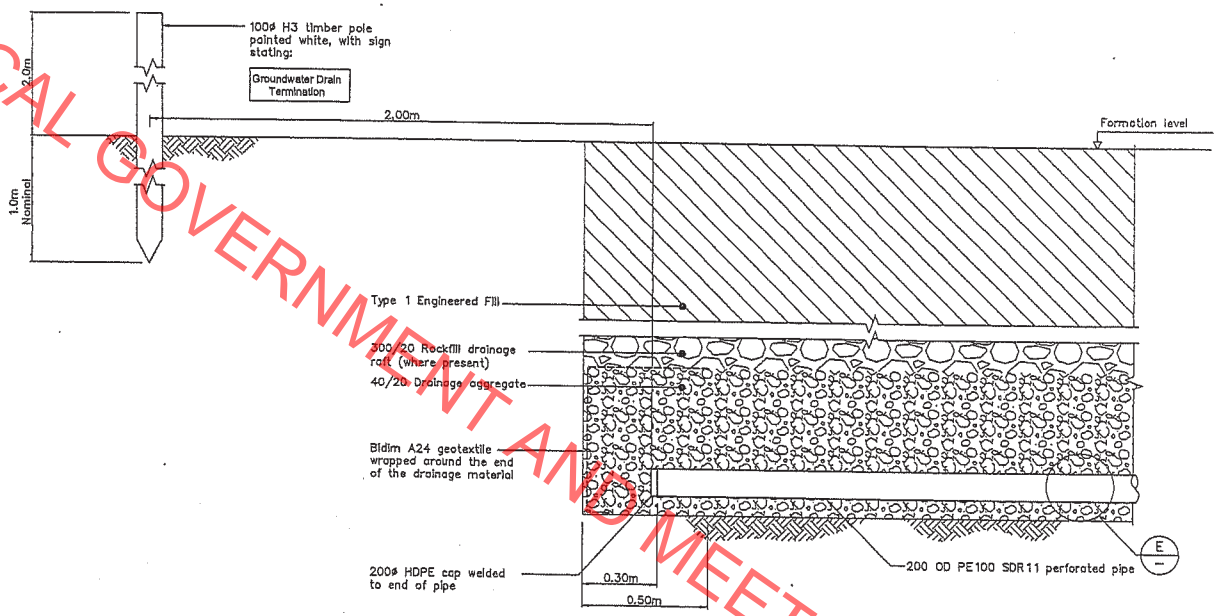


DETAIL D 106 EARTHWORKS TRIMMING
SCALE 1:25



DETAIL E 106 PERFORATION DETAIL
SCALE N.T.S



DETAIL F 106 PRINCIPAL AND GULLY GROUNDWATER DRAIN TERMINATIONS
SCALE 1:10

A1 SCALE 1:25
0 0.5 1.0 1.5 2.0 2.5 (m)

REVISION DESCRIPTION	BY	DATE
B Construction Issue		
A Tender Issue		

DESIGNED : SJS Sep.05
DRAWN : RDB Sep.05
DESIGN CHECKED :
DRAFTING CHECKED :
CADFILE : L:\8309 1\300\Drawings\
APPROVED :
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NOTES :
1. All dimensions are in millimetres unless noted otherwise.
2. Rockfill material grading to be determined based on achieveable grading of onsite material.
3. 40/20 drainage aggregate to be well rounded

REFERENCE :

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Auckland Christchurch Hamilton Whangarei Nelson

HUTT CITY
SILVERSTREAM LANDFILL
SS2 Contract: AD 16 3559
TITLE
PHASE 1 FORMATION WORKS
Groundwater Drainage Details – Sheet 2 of 2
SCALES (AT A1 SIZE) 1:25
DWG. No. 8309 1.300–FOR 107
REV. B

I:\8309\300\8309\300-FOR108_107.dwg, 107, 17/01/2006 2:59:44 p., rgo, b&w A3 laser.pc3, A3 (297 x 420 mm), 1:2

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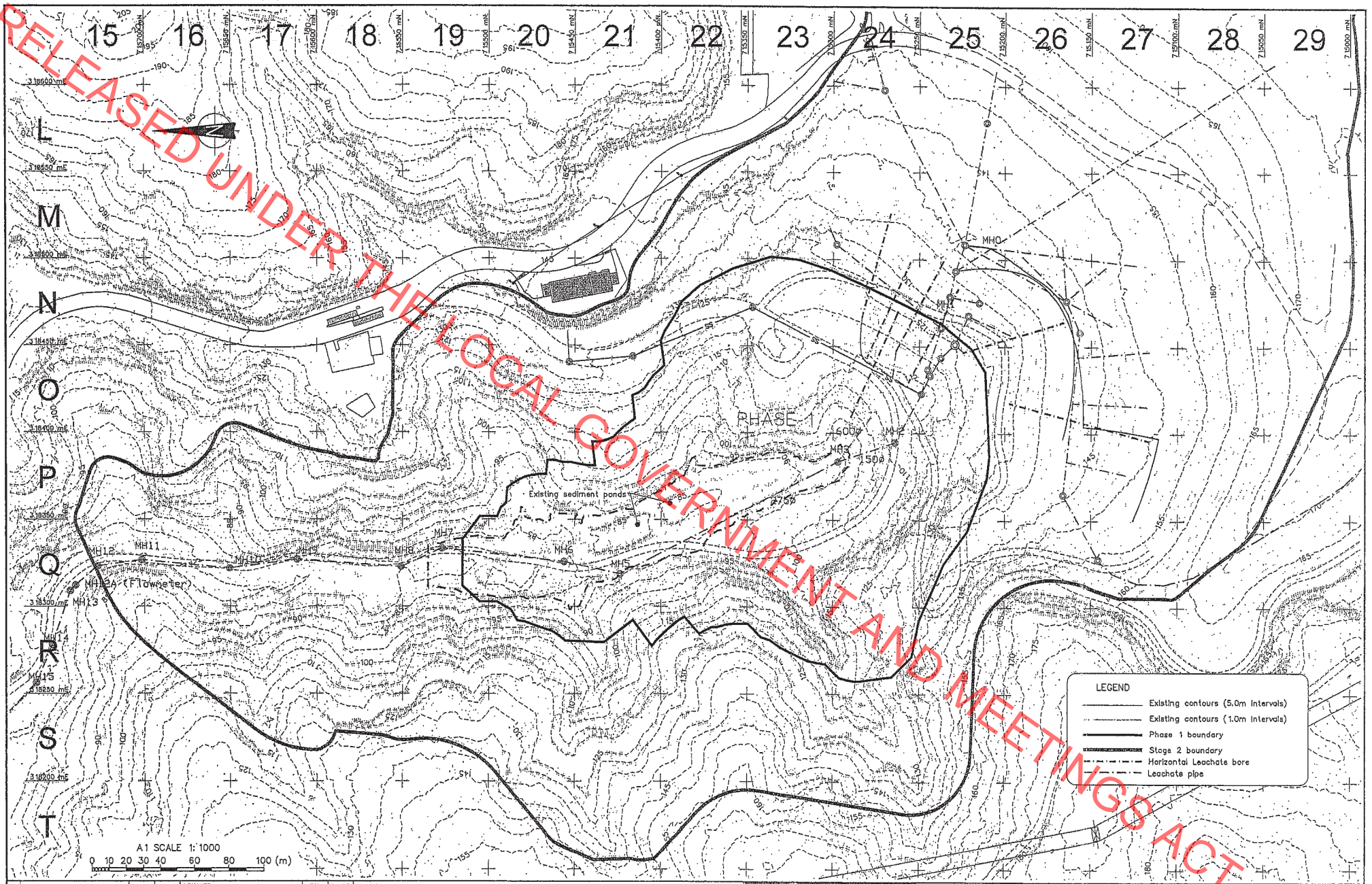

REVISION	DESCRIPTION	BY	DATE
B	Construction Issue		1/06
A	Tender Issue		1/06

DESIGNED : GIW Nov.05
DRAWN : GIW Nov.05
DESIGN CHECKED : 1/06
DRAFTING CHECKED : 1/06
CADFILE : L:\83091\..\8309 1.300-LCS401
APPROVED : 11/06

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HUTT CITY SILVERSTREAM LANDFILL
SS2 Contract: AD 16 3559

TITLE
PHASE 1
Existing Leachate System

SCALES (AT A1 SIZE) 1000

DWG. No. 830 -LCS

REV. B

L:\83091\300\83091.300-LCS401.dwg, 401, 18/01/2006 10:25:08 a., rgc, b&w A3 laser.pc3, A3 (297 x 420 mm), 0.03937:1:2

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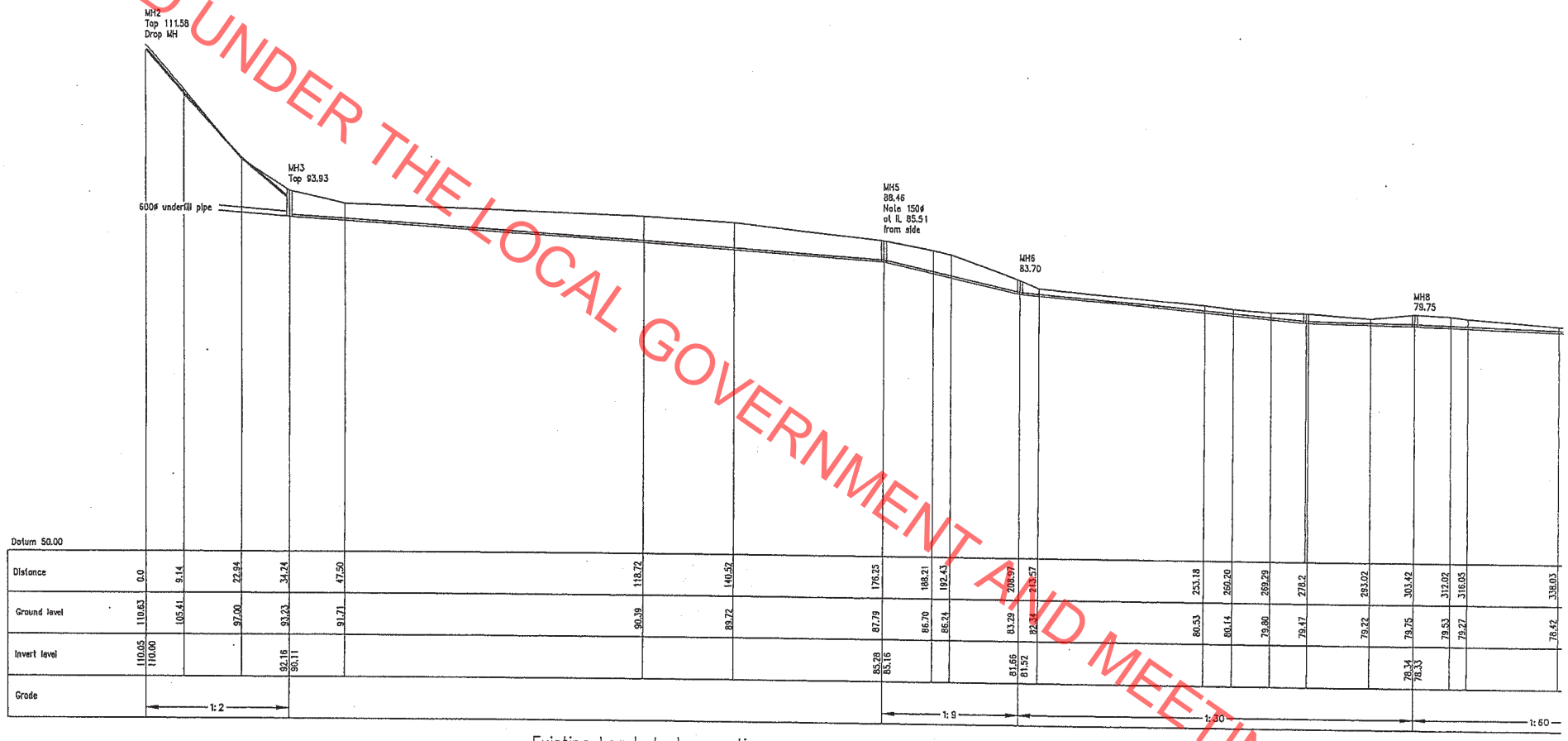

Existing Leachate Longsection

Scale Hor 1: 1000
Vert 1:500

				DESIGNED :	GIW	Nov.05	NOTES :
				DRAWN :	GIW	Nov.05	
				DESIGN CHECKED :		1/06	
				DRAFTING CHECKED :		1/06	
				CADFILE : L:\8309 1\300\Drawings\			
B	Construction Issue	GIW	11/1/06	APPROVED :		17/1/06	
A	Tender Issue	GIW	5/12/05	This drawing is not to be used for construction purposes unless signed as Approved			
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HUTT CITY

SILVERSTREAM LANDFILL
SS2 Contract: AD 16 3559

TITLE
PHASE 1
Existing Leachate Line – Longsection

SCALES (AT A1 SIZE) 1: 1000

DWG. No. 8309 1.300–LCS402

REV. B

I:\8309\1300\8309 1.300-LCS402.dwg, 402, 17/01/2006 3:00:01 p., tgs, b&w A3 laser.pc3, A3 (297 x 420 mm), 1:2

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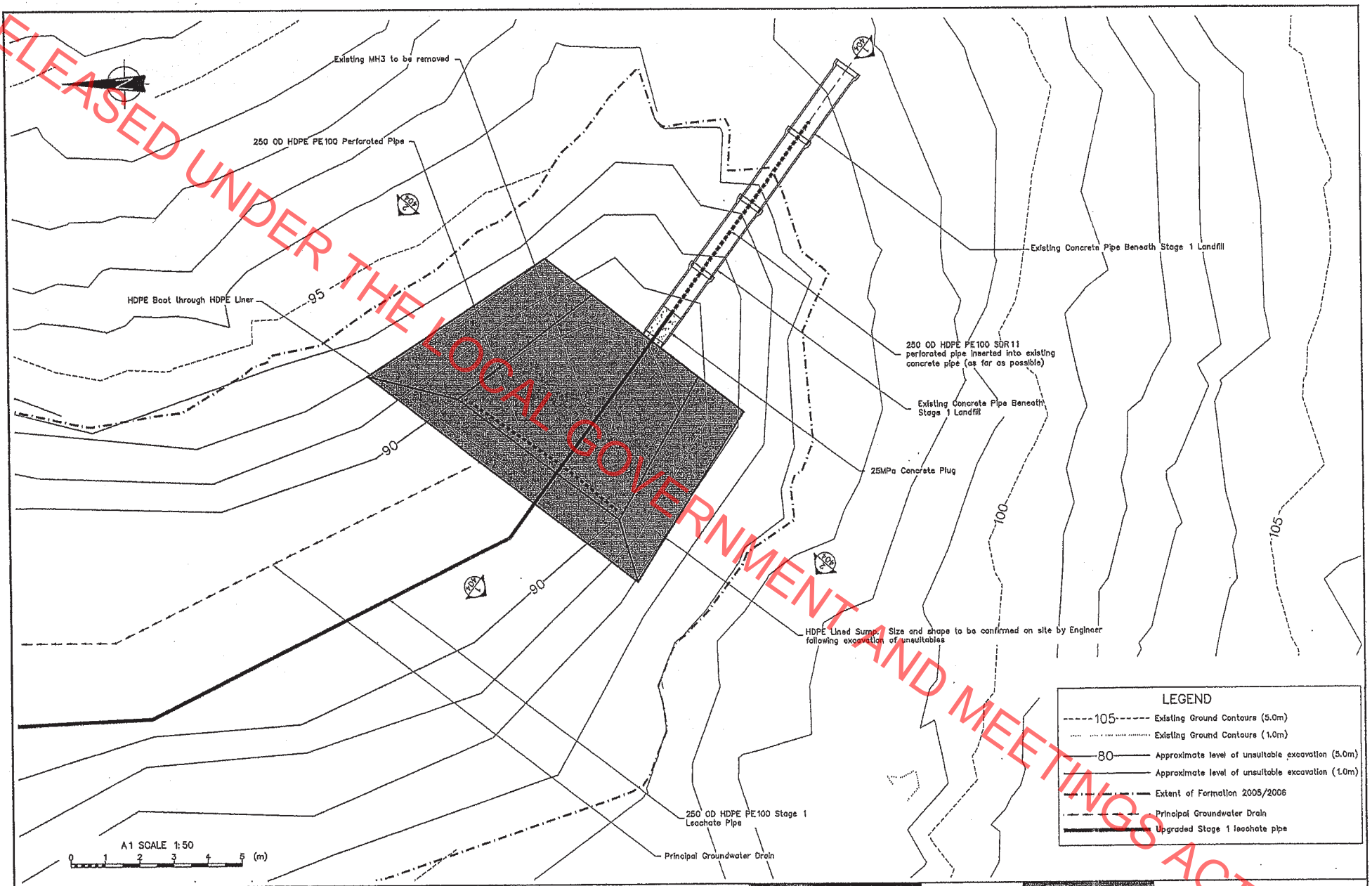

L:\8309\1300\8309\1.300-LCS403.dwg, 403, 30/03/2006 3:51:03 p., rgc, b&w A3 laser.pc3, A3 (297 x 420 mm), 0.033370112

REVISION	DESCRIPTION	BY	DATE
A	Preliminary		30/3

DESIGNED :	RGC	Mar.05
DRAWN :	RGC	Mar.05
DESIGN CHECKED :		30/3
DRAFTING CHECKED :		30/3
CADFILE : L:\8309\1\300\Drawings\		
APPROVED :		

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REFERENCE :

NOTES :
1. Coordinate Datum: NZ Geodetic 1949 Wellington Circuit Coordinates
Origin: Mt Cook 700,000 mN 300,000 mE
Level Datum: LINZ (MSL) Auckland Vertical Datum 1946

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HUTT CITY

SILVERSTREAM LANDFILL
SS2 Contract: AD 16 3559

TITLE
PHASE 1
Stage 1 Leachate Sump

SCALES (AT A1 SIZE)
1:50

DWG. No. 8309 1.300-LCS406

REV. A

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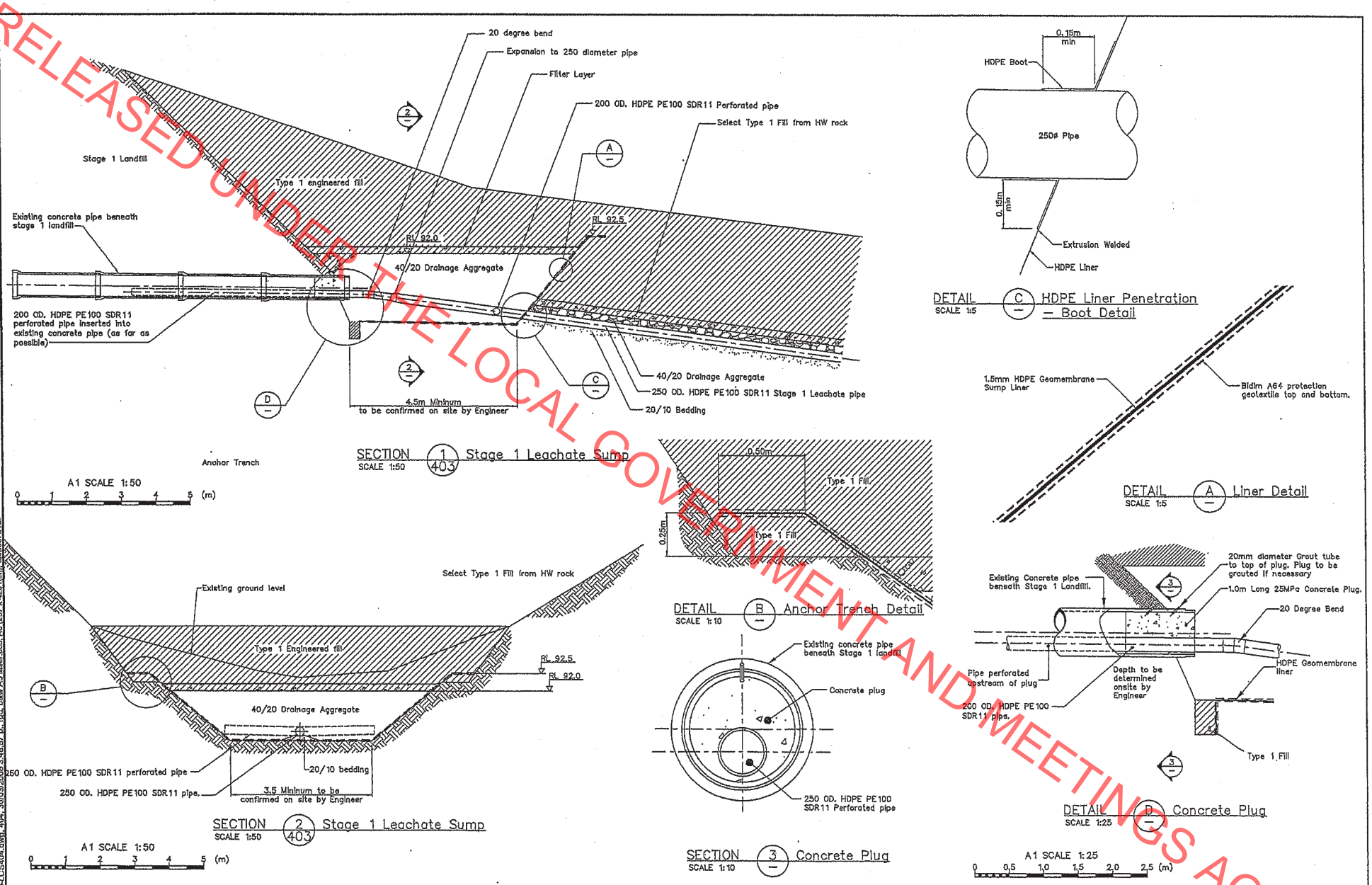

L:\8309\1\300\8309\1.300-LCS404.dwn, 404, 30/03/2006 3:46:57 p, rgc, b&w A3 laser.pc3, A3 (297 x 420 mm), 0.039370\2

REVISION	DESCRIPTION	BY	DATE
A	Preliminary		30/3

DESIGNED : RGC Feb 06
DRAWN : NRM Mar 06
DESIGN CHECKED : 30/3
DRAFTING CHECKED : 30/3
CADFILE : L:\8309\1\300\Drawings\
APPROVED :

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NOTES :
PROPOSED CONSTRUCTION SEQUENCE
1. Excavate unsuitables, lowering existing MH3 as excavation proceeds. (Leave base of Manhole in place so that low level leachate continues to flow through to existing system)
2. Lay new leachate pipe up to MH3.
3. Insert perforated pipe into existing concrete pipe as far as possible.
4. Connect perforated pipe to new leachate pipe.
5. Plug concrete pipe diverting leachate into new pipe. Remove manhole base and existing leachate pipe.
6. Place 300/20 rockfill up to sump.
7. Construct HDPE lined sump beneath new pipe and backfill with 40/20 drainage aggregate.
8. Place Type 1 Engineered Fill.

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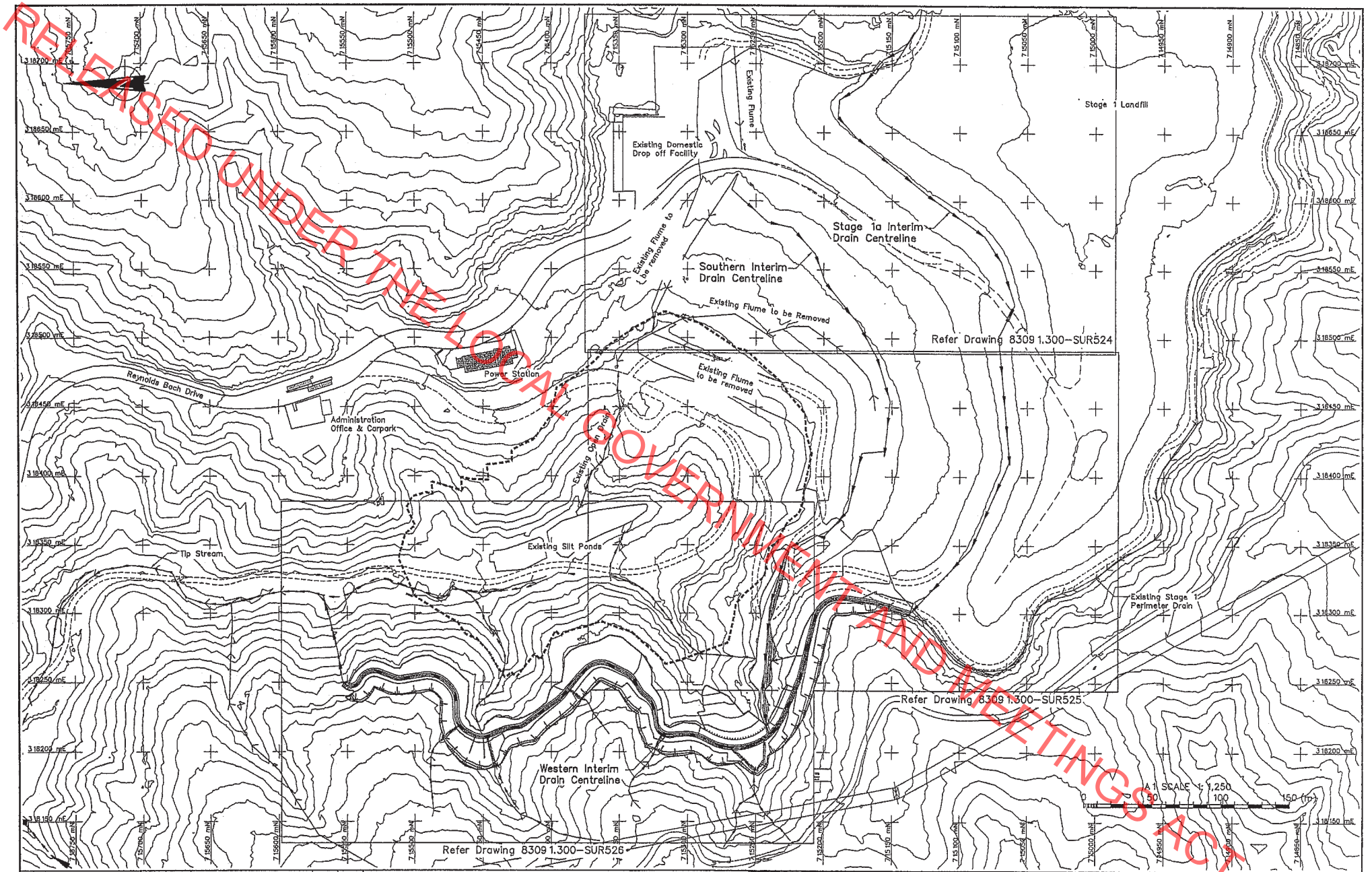
HUTT CITY
SILVERSTREAM LANDFILL
SS2 Contract: AD 16 3559
TITLE
PHASE 1
Stage 1 Leachate Sump Details
SCALES (AT A1 SIZE) As Shown
DWG. No. 8309 1.300-LCS404
REV. A



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REVISION	DESCRIPTION	BY	DATE
B	Construction Issue		17/1/06
A	Tender Issue		

DESIGNED :	RGC	Oct.05
DRAWN :	NRM	Oct.05
DESIGN CHECKED :		17/1/06
DRAFTING CHECKED :		17/1/06
CADFILE : L:\8309 1\300\SUR523-526.dwg		
APPROVED :		17/1/06

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NOTES :
1. All dimensions are in millimetres unless noted otherwise.
2. Existing ground contours created from Airborne Laser Scanning data flown 2 August 2005. Data provided by AAMHATCH Pty Ltd, Reference: 2 10 11 190 1nob.
3. Coordinates:
Coordinate Datum: NZ Geodetic 1949 Wellington Circuit Coordinates
Origin: Mt Cook 700,000 mN 300,000 mE
Level Datum: LINZ (MSL)

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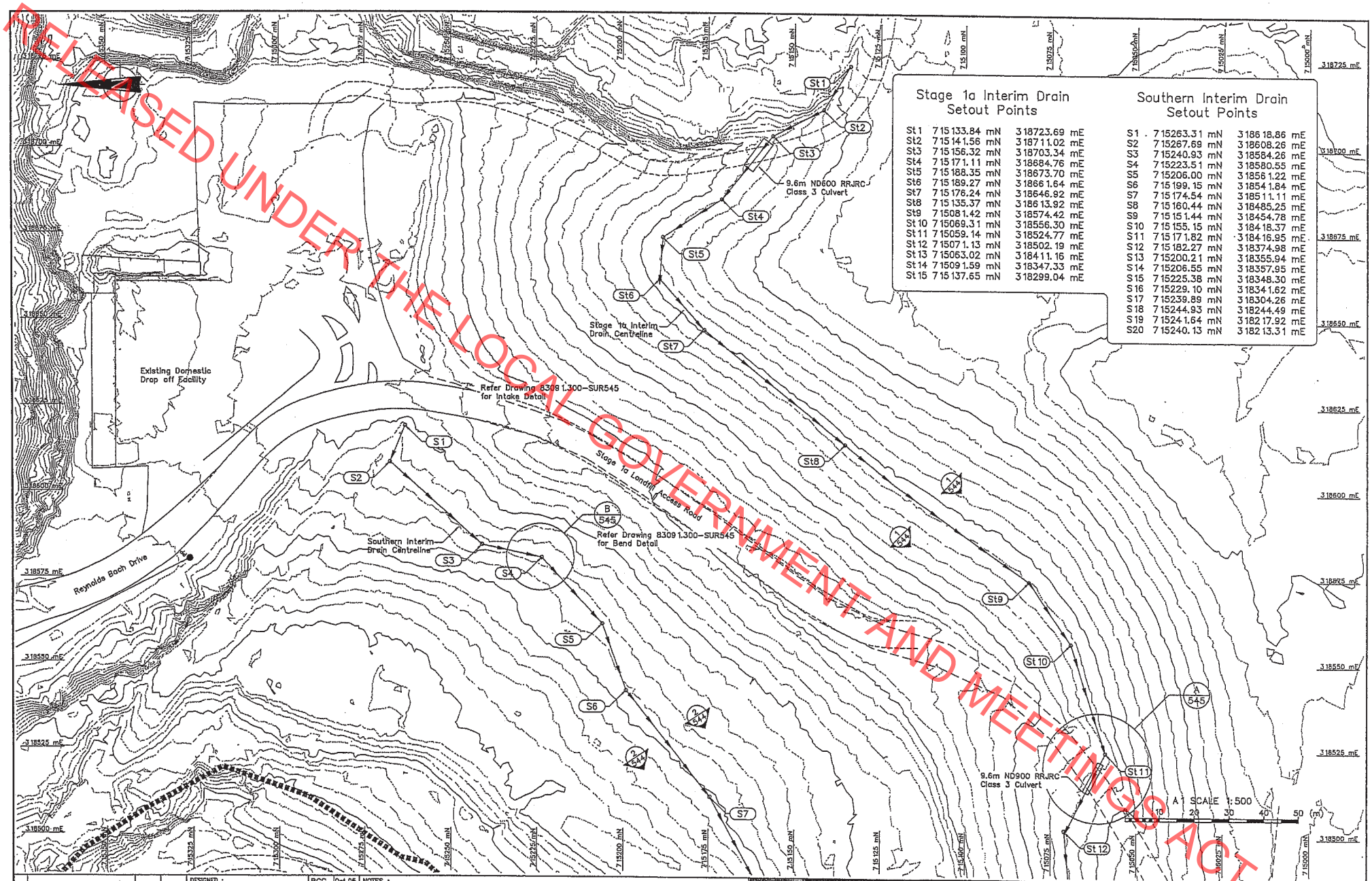
HUTT CITY

SILVERSTREAM LANDFILL
SS2 Contract: AD16-3559

TITLE
WESTERN PERIMETER SURFACE WATER SYSTEM
Surface Water General Arrangement (Sheet 1 of 4)

SCALES (AT A1 SIZE) 1:1,250
DWG. No. 8309 1.300-SUR523
REV. B

I:\8309\1\300\8309_300-SUR523-526.dwg, SUR523, 17/01/2006 3:00:10 p., rgc, b&w A3 laser.pc3, A3 (297 x 420 mm), 1:2



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REVISION	DESCRIPTION	BY	DATE
B	Construction Issue		1/06
A	Tender Issue		

DESIGNED : RGC Oct.05
DRAWN : NRM Oct.05
DESIGN CHECKED : 1/06
DRAFTING CHECKED : 1/06
CADFILE : L:\8309 1\300\SUR523-526.dwg
APPROVED : 17/1/06

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NOTES :
1. All dimensions are in millimetres unless noted otherwise.
2. Existing ground contours created from Airborne Laser Scanning data flown 2 August 2005. Data provided by AAMHATCH Pty Ltd, Reference: 2 10 11 190 Inob.
3. Coordinates:
Coordinate Datum: NZ Geodetic 1949 Wellington Circuit Coordinates
Origin: Mt Cook 700,000 mN 300,000 mE
Level Datum: LINZ (MSL)

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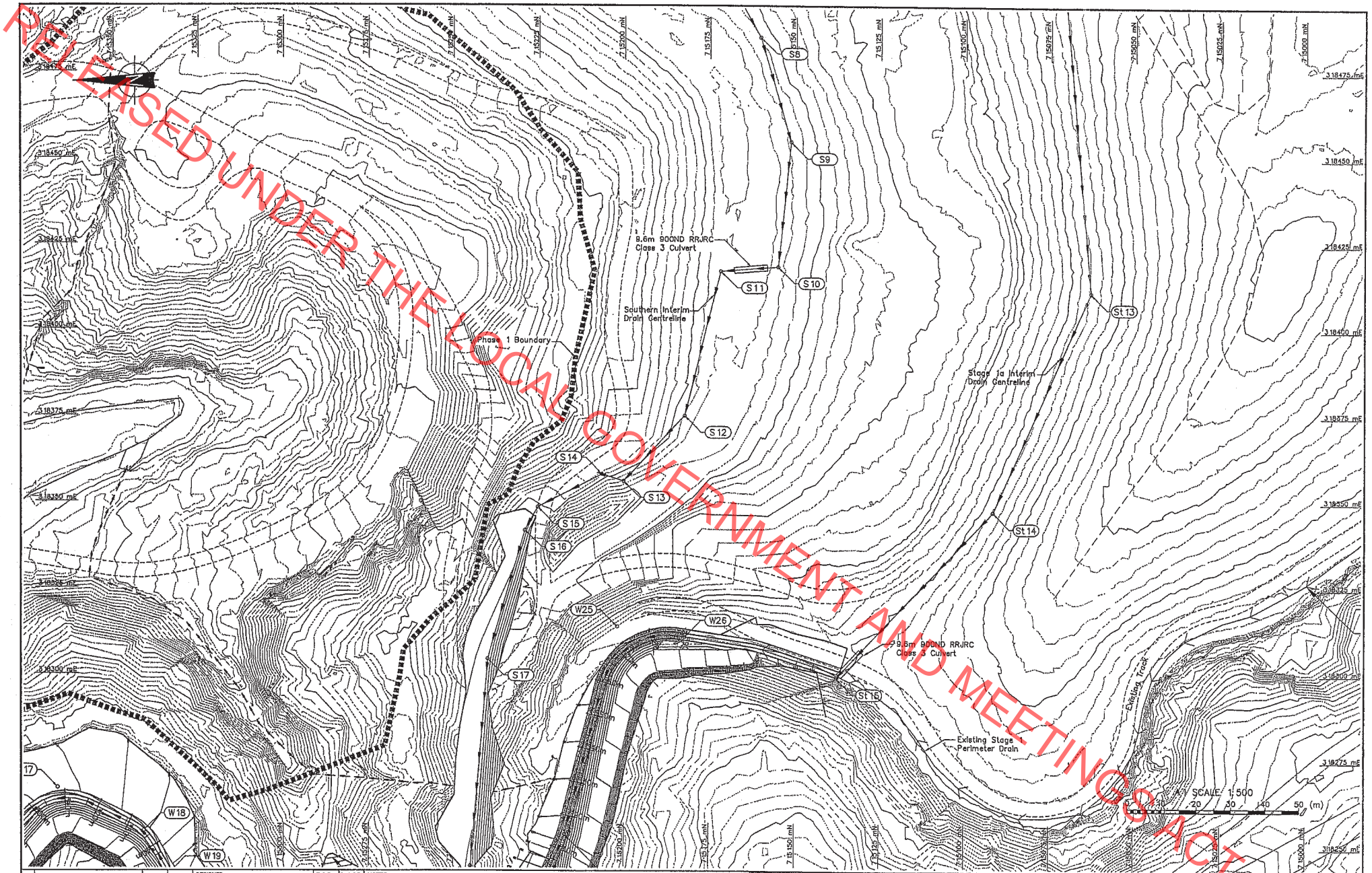
HUTT CITY

SILVERSTREAM LANDFILL
SS2 Contract: AD 16-3559

TITLE
WESTERN PERIMETER SURFACE WATER SYSTEM
Surface Water General Arrangement (Sheet 2 of 4)

SCALES (A1 A3 SIZE) 1:500
DWG. No. 8309 1.300-SUR524
REV. B

L:\8309\1300\8309\1.300-SUR523-528.dwg, SUR524, 17/01/2006 3:00:13 p., rgc, b&w A3 laser.pc3, A3 (297 x 420 mm), 1:2



REVISION DESCRIPTION	BY	DATE
B Construction Issue		17/1/06
A Tender Issue		

DESIGNED :	RGC	Oct.05
DRAWN :	NRM	Oct.05
DESIGN CHECKED :		17/1/06
DRAFTING CHECKED :		17/1/06
CADFILE : L:\8309 1\300\SUR523-526.dwg		
APPROVED :		17/1/06

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NOTES :
1. All dimensions are in millimetres unless noted otherwise.
2. Existing ground contours created from Airborne Laser Scanning data flown 2 August 2005. Data provided by AAMHATCH Pty Ltd, Reference: 2 10 11 190 1nob.
3. Coordinates:
   Coordinate Datum: NZ Geodetic 1949 Wellington Circuit Coordinates
   Origin: Mt Cook 700,000 mN 300,000 mE
   Level Datum: LINZ (MSL)
4. Refer Drawing 8309 1.300–SUR524 for Setout Coordinates.
5. Refer Drawing 8309 1.300–SUR526 for Western Interim Drain Setout Data.

REFERENCE :

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Auckland Christchurch Nelson

HUTT CITY

SILVERSTREAM LANDFILL
SS2 Contract: AD16–3559

TITLE
WESTERN PERIMETER SURFACE WATER SYSTEM
Surface Water General Arrangement (Sheet 3 of 4)

SCALES (AT A1 SIZE)	DWG. No.	REV.
1:500	8309 –SUR	B

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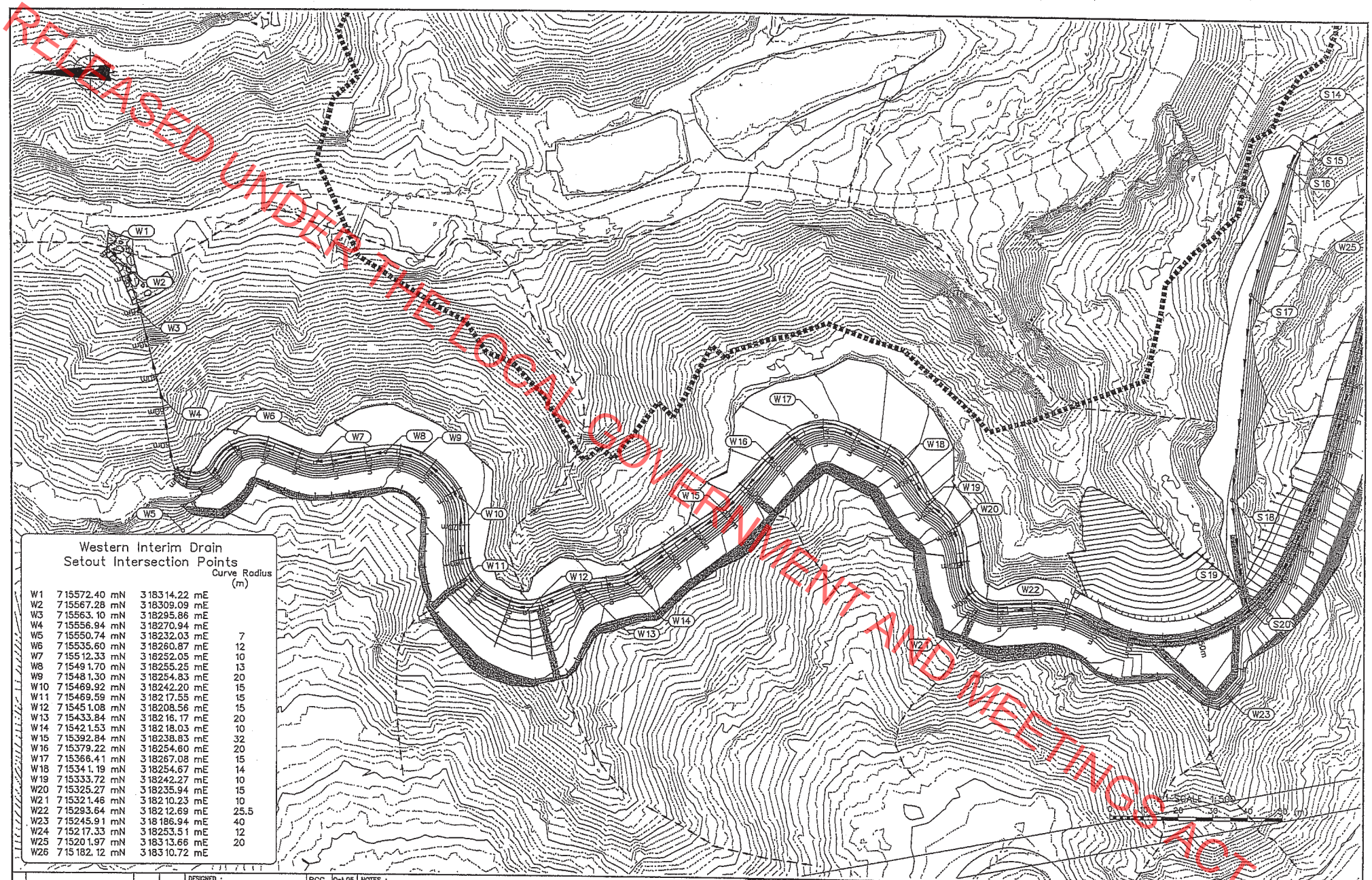
I:\8309\1300\8309\1.300-SUR523-526.dwg, SUR525, 17/01/2006 3:00:16 p.., rgc, b&w A3 laser.pc3, A3 (297 x 420 mm), 1:2



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Western Interim Drain
Setout Intersection Points

			Curve Radius (m)
W1	7 15572.40 mN	3 18314.22 mE	
W2	7 15567.28 mN	3 18309.09 mE	
W3	7 15563. 10 mN	3 18295.86 mE	
W4	7 15556.94 mN	3 18270.94 mE	
W5	7 15550.74 mN	3 18232.03 mE	7
W6	7 15535.60 mN	3 18260.87 mE	12
W7	7 15512.33 mN	3 18252.05 mE	10
W8	7 1549 1.70 mN	3 18255.25 mE	13
W9	7 1548 1.30 mN	3 18254.83 mE	20
W10	7 15469.92 mN	3 18242.20 mE	15
W11	7 15469.59 mN	3 18217.55 mE	15
W12	7 1545 1.08 mN	3 18208.56 mE	15
W13	7 15433.84 mN	3 18216. 17 mE	20
W14	7 1542 1.53 mN	3 18218.03 mE	10
W15	7 15392.84 mN	3 18238.83 mE	32
W16	7 15379.22 mN	3 18254.60 mE	20
W17	7 15366.41 mN	3 18267.08 mE	15
W18	7 1534 1. 19 mN	3 18254.67 mE	14
W19	7 15333.72 mN	3 18242.27 mE	10
W20	7 15325.27 mN	3 18235.94 mE	15
W21	7 1532 1.46 mN	3 18210.23 mE	10
W22	7 15293.64 mN	3 18212.69 mE	25.5
W23	7 15245.91 mN	3 18186.94 mE	40
W24	7 1521 7.33 mN	3 18253.51 mE	12
W25	7 1520 1.97 mN	3 18313.66 mE	20
W26	7 15 182. 12 mN	3 18310.72 mE	

REVISION	DESCRIPTION	BY	DATE
B	Construction Issue		11/06
A	Tender Issue		

DESIGNED : RGC Oct.05
DRAWN : NRM Oct.05
DESIGN CHECKED :
DRAFTING CHECKED :
CADFILE : L:\8309 1\300\SUR523-526.dwg
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3. Coordinates:
   Coordinate Datum: NZ Geodetic 1949 Wellington Circuit Coordinates
   Origin: Mt Cook 700,000 mN 300,000 mE
   Level Datum: LINZ (MSL)
4. Refer Drawing 8309 1.300–SUR525 for Southern Interim Drain Setout data.

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HUTT CITY

TITLE
SILVERSTREAM LANDFILL
SS2 Contract: AD16–3559
WESTERN PERIMETER SURFACE WATER SYSTEM
Surface Water General Arrangement (Sheet 4 of 4)

SCALES (AT A1 SIZE) 1: 500
DWG. No. 8309 1.300–SUR526
REV. B

I:\8309\1\300\8309\1.300-SUR523-526.dwg, SUR526, 17/01/2006 3:00:29 p., rgs, b&w A3 laser.pc3, A3 (297 x 420 mm), 1:2

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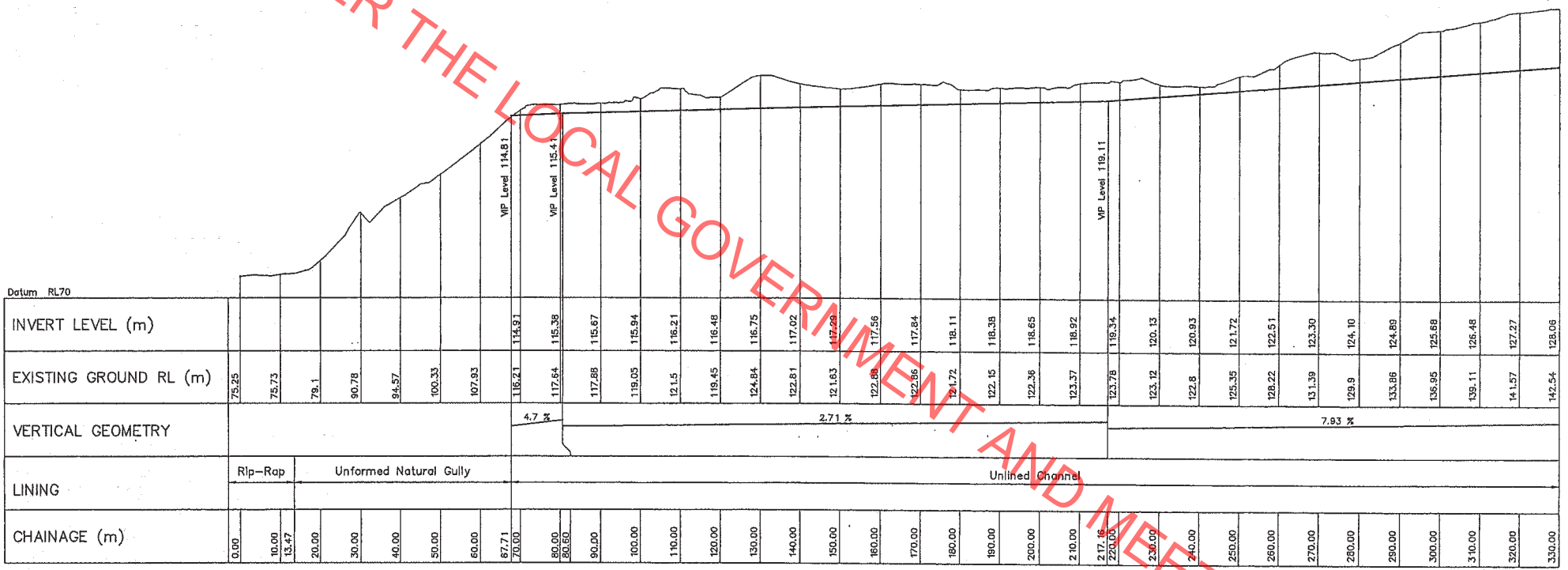

WESTERN INTERIM DRAIN LONGSECTION
SCALE 1:500

A1 SCALE 1:500
0 10 20 30 40 50 (m)

REVISION DESCRIPTION	BY	DATE
B Construction Issue		1/06
A Tender Issue		

DESIGNED : RGC Nov.05
DRAWN : NRM Nov.05
DESIGN CHECKED :
DRAFTING CHECKED :
CADFILE : L:\8309 1\300\8309 1.300-SUR52 1.dwg
APPROVED :
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HUTT CITY

SILVERSTREAM LANDFILL
SS2 Contract: AD 16 3559

TITLE
WESTERN PERIMETER SURFACE WATER SYSTEM
Western Interim Drain Longsection (Sheet 1 of 2)

SCALES (AT A1 SIZE) 1:500 DWG. No. 8309 [illegible]-SUR REV. B

I:\8309\1\300\8309 1.300-SUR527-528.dwg, 527, 17/01/2006 3:00:26 p., rgc, b&w A3 laser.pc3, A3 (297 x 420 mm), 1:2

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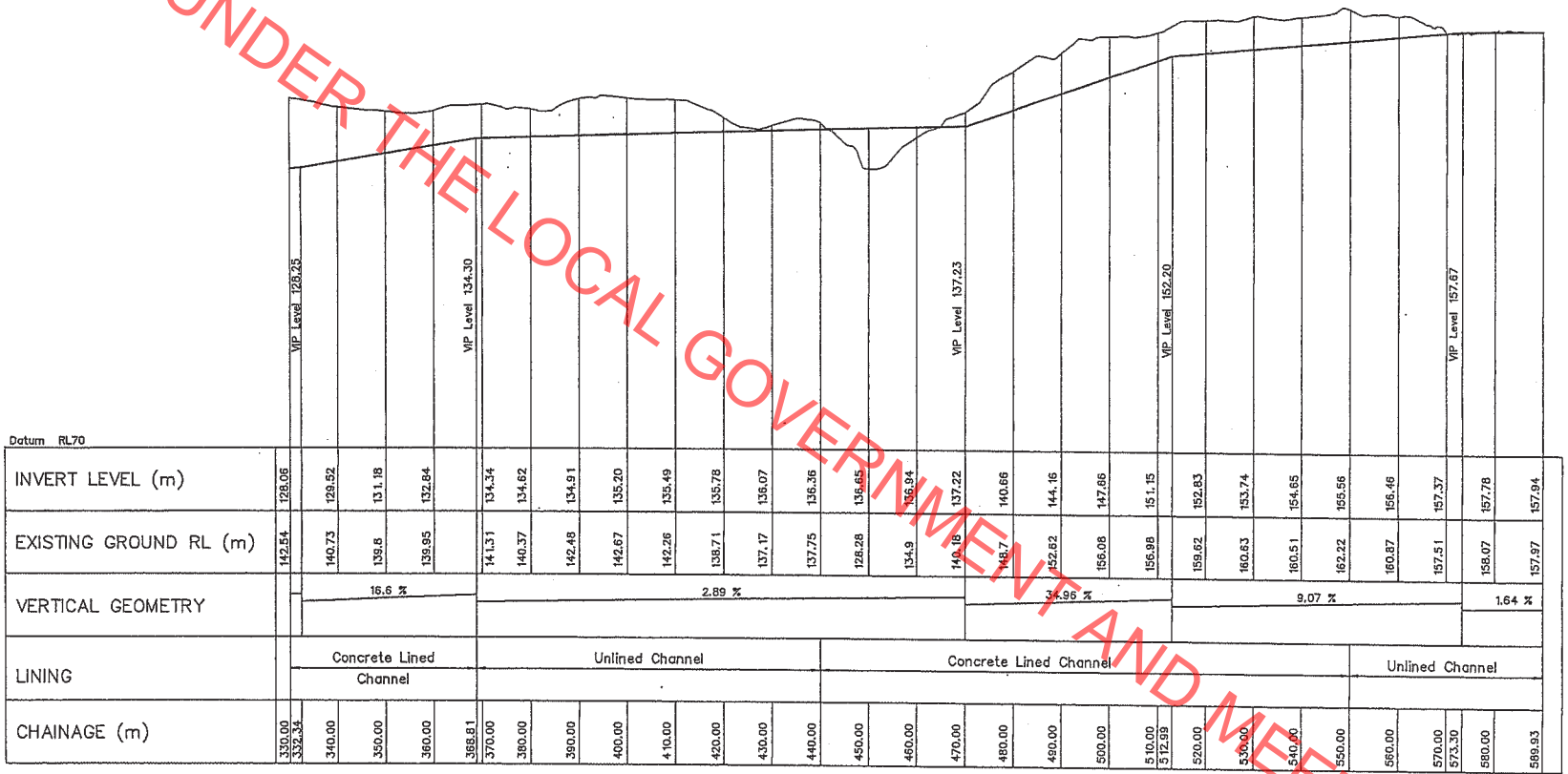

Datum RL70

| | | |

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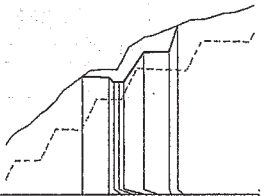

Datum 94

| | | |

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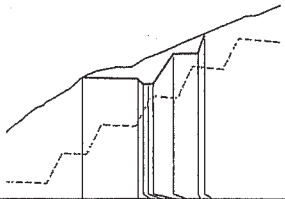

Datum 95

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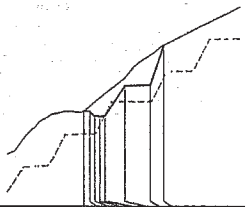
RELEASED UNDER THE LOCAL GOVERNMENT AND MEETINGS ACT 1987



Datum 104

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Datum 119

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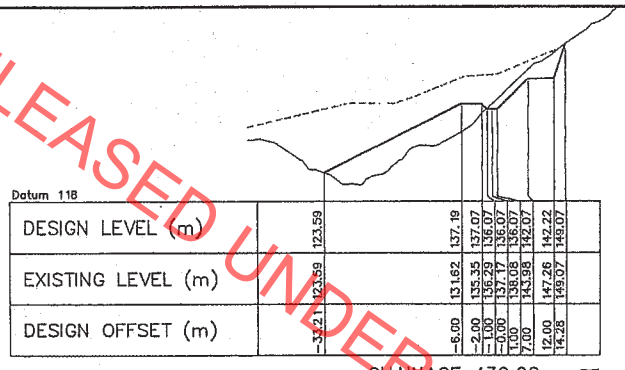
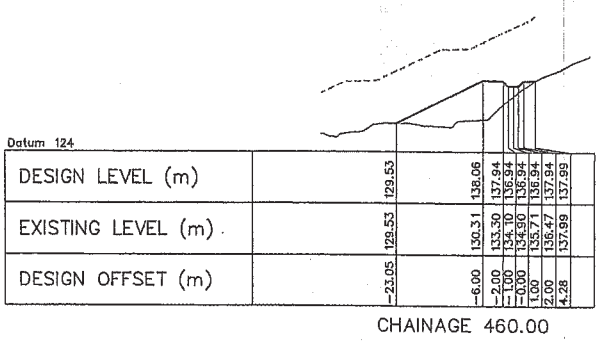


Datum 118

DESIGN LEVEL (m)		123.59				137.19	137.07						
EXISTING LEVEL (m)		123.59				131.62	135.35	136.29	137.17	138.08	143.98	147.26	149.07
DESIGN OFFSET (m)	-32.21				-6.00	-2.00	-1.00	-0.00	1.00	7.00	12.00	14.28	

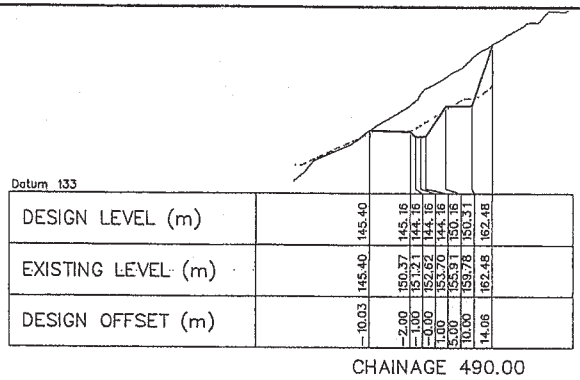
CHAINAGE 430.00



Datum 124

DESIGN LEVEL (m)		129.53				138.06	137.94						
EXISTING LEVEL (m)		129.53				130.31	133.30	134.10	134.90	135.71	136.47	137.94	137.99
DESIGN OFFSET (m)	-23.05				-6.00	-2.00	-1.00	-0.00	1.00	2.00	4.28		

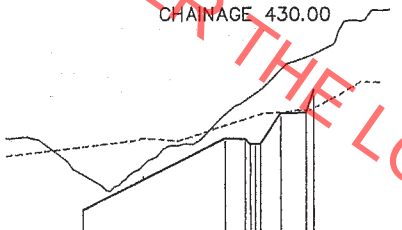
CHAINAGE 460.00



Datum 133

DESIGN LEVEL (m)		145.40				145.16	144.16						
EXISTING LEVEL (m)		145.40				150.37	151.21	152.62	153.91	155.47	156.81	159.78	162.48
DESIGN OFFSET (m)	-10.03				-2.00	-1.00	-0.00	1.00	5.00	10.00	14.06		

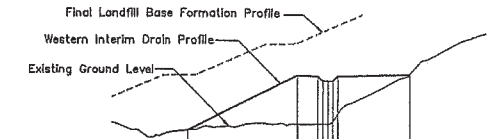
CHAINAGE 490.00



Datum 117

DESIGN LEVEL (m)		122.79				136.90	136.78						
EXISTING LEVEL (m)		122.79				134.58	137.34	136.03	135.78	138.71	139.40	142.70	146.31
DESIGN OFFSET (m)	-34.21				-6.00	-2.00	-1.00	-0.00	1.00	5.00	11.48		

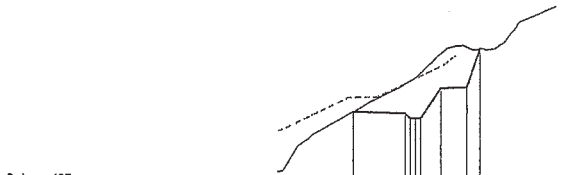
CHAINAGE 420.00



Datum 123

DESIGN LEVEL (m)		126.91				137.77	137.65						
EXISTING LEVEL (m)		126.91				128.19	128.24	128.25	128.28	128.66	130.26	138.07	
DESIGN OFFSET (m)	-27.71				-6.00	-2.00	-1.00	0.00	1.00	2.00	16.17		

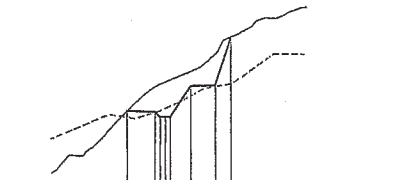
CHAINAGE 450.00



Datum 127

DESIGN LEVEL (m)		141.97				141.66	140.66						
EXISTING LEVEL (m)		141.97				147.47	148.08	148.60	149.06	153.43	154.79	156.81	154.46
DESIGN OFFSET (m)	-12.20				-2.00	-1.00	-0.00	1.00	5.00	10.00	12.35		

CHAINAGE 480.00



Datum 122

DESIGN LEVEL (m)		136.66				136.49	135.49						
EXISTING LEVEL (m)		136.66				141.31	141.84	142.26	142.67	144.34	147.70	151.03	
DESIGN OFFSET (m)	-7.59				-2.00	-1.00	-0.00	1.00	5.00	10.00	13.13		

CHAINAGE 410.00

Datum 120

DESIGN LEVEL (m)		124.54				137.48	137.36						
EXISTING LEVEL (m)		124.54				130.81	136.43	137.13	137.75	136.36	136.21	136.11	139.11
DESIGN OFFSET (m)	-31.87				-6.00	-2.00	-1.00	-0.00	1.00	3.00			

CHAINAGE 440.00

Datum 128

DESIGN LEVEL (m)		138.56				138.56	138.34	138.22	137.22	137.22	143.22	143.22	149.53
EXISTING LEVEL (m)		138.56				138.66	138.12	140.12	140.18	140.40	142.70	143.22	149.53
DESIGN OFFSET (m)	-6.22				-6.00	-2.00	-1.00	-0.00	1.00	5.00	12.06		

CHAINAGE 470.00

A1 SCALE 1:500

0 10 20 30 40 50 (m)

REVISION	DESCRIPTION	BY	DATE
B	Construction Issue		11/06
A	Tender Issue		

DESIGNED : RGC Nov.05
DRAWN : NRM Nov.05
DESIGN CHECKED :
DRAFTING CHECKED :
CADFILE : L:\83091\300\83091.300-SUR521.dwg
APPROVED : 11/06

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NOTES :

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Environmental & Engineering Consultants

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Email : well@tonkin.co.nz

Auckland Christchurch Hamilton Whangarei Nelson

HUTT CITY

SILVERSTREAM LANDFILL
SS2 Contract: AD 16 3559

TITLE
WESTERN PERIMETER SURFACE WATER SYSTEM
Western Interim Drain Cross Section (Sheet 5 of 6)

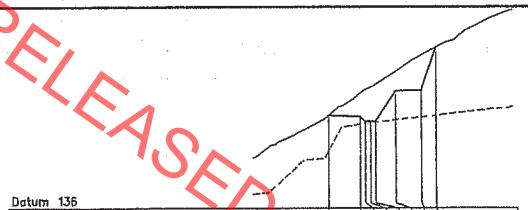
SCALES (AT A1 SIZE) 1:500

DWG. No. 8309[illegible]-SUR[illegible]

REV. B

I:\83091\300\83091.300-SUR529-534.dwg, 533, 17/01/2006 3:00:40 p., rgc, b&w A3 laser.pc3, A3 (297 x 420 mm), 1:2

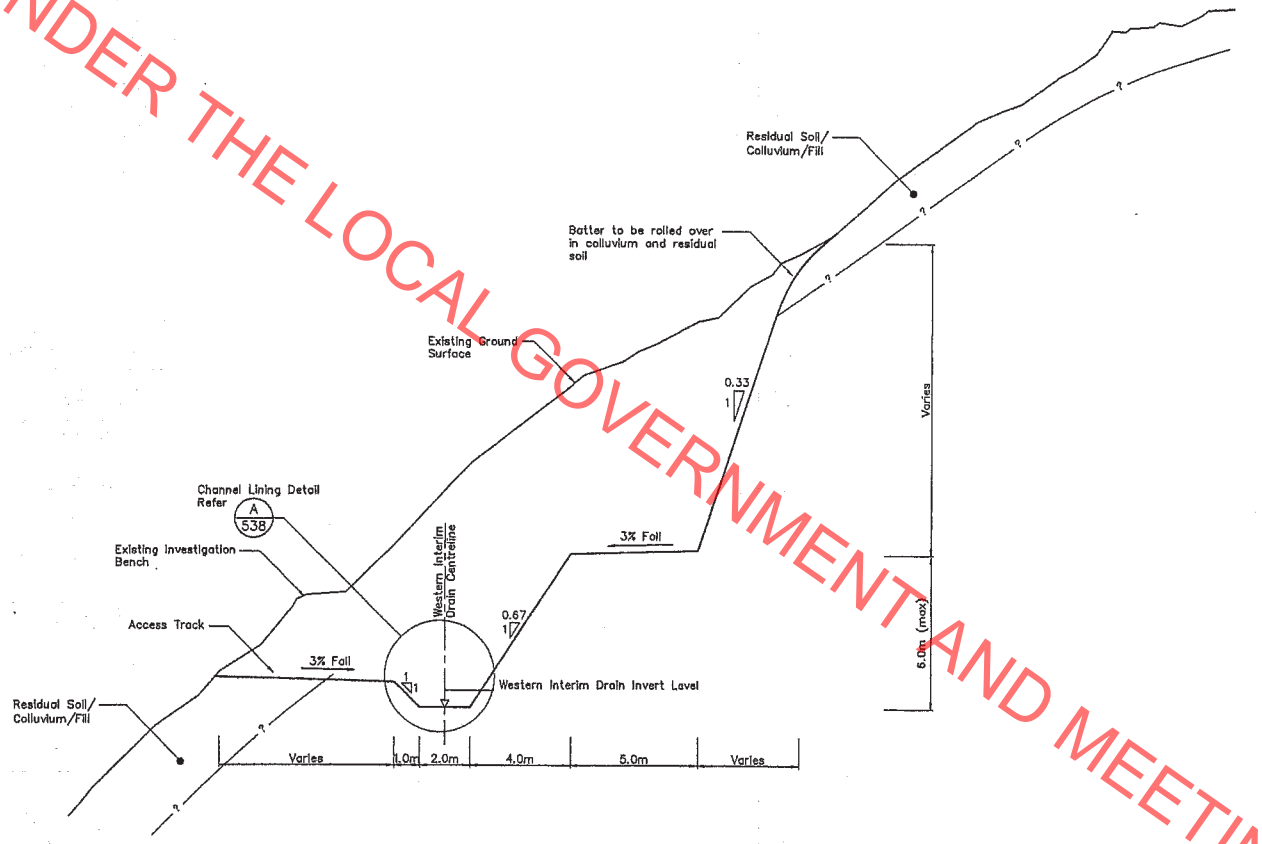
RELEASED UNDER THE LOCAL GOVERNMENT AND MEETINGS ACT 1987



Datum 136

| | | |

RELEASED UNDER THE LOCAL GOVERNMENT AND MEETINGS ACT 1987



SECTION 1 526 TYPICAL CROSS SECTION
SCALE 1:100

A1 SCALE 1: 100
0 1 2 3 4 6 8 10 (m)

REVISION DESCRIPTION	BY	DATE
B Construction Issue		1/06
A Tender Issue		

DESIGNED : RGC Nov.05
DRAWN : NRM Nov.05
DESIGN CHECKED :
DRAFTING CHECKED :
CADFILE : L:\8309 1\300\8309 1.300-SUR521.dwg
APPROVED
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NOTES :
1. All dimensions are in millimetres unless noted otherwise.
2. Drain to be located in Rock. Location of soil/rock interface indicative only. Extent of soil/fill/rock to be determined on site by Engineer.

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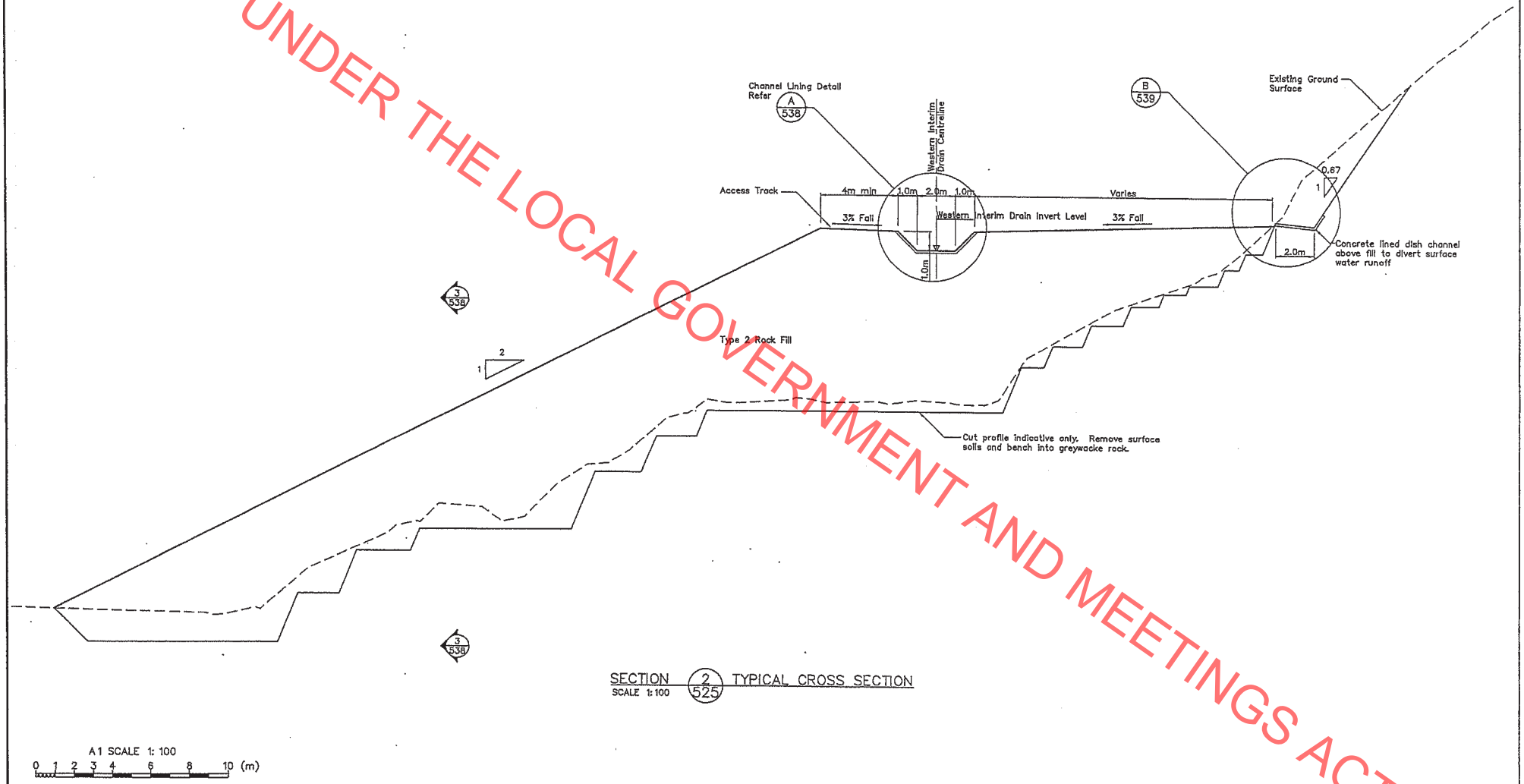
Auckland Christchurch Hamilton Whangarei Nelson

HUTT CITY
SILVERSTREAM LANDFILL
SS2 Contract: AD 16 3559
TITLE
WESTERN PERIMETER SURFACE WATER SYSTEM
Western Interim Drain – Typical Cut Section
SCALES (A1 A1 SIZE) 1:100
DWG. No. 8309 -SUR
REV. B

I:\8309\300\8309\300-SUR535.dwg, 535, 17/01/2006 3:00:46 p, rgc, b&w A3 laser.pc3, A3 (297 x 420 mm), 1:2

RELEASED UNDER THE LOCAL GOVERNMENT AND MEETINGS ACT 1987



SECTION 2 525 TYPICAL CROSS SECTION
SCALE 1:100

A1 SCALE 1: 100
0 1 2 3 4 6 8 10 (m)

REVISION	DESCRIPTION	BY	DATE
B	Construction Issue		
A	Tender Issue		

DESIGNED : RGC Nov.05
DRAWN : NRM Nov.05
DESIGN CHECKED :
DRAFTING CHECKED :
CADFILE : L:\8309 1\300\8309 1.300-SUR521.dwg
APPROVED :
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NOTES :
1. All dimensions are in millimetres unless noted otherwise.

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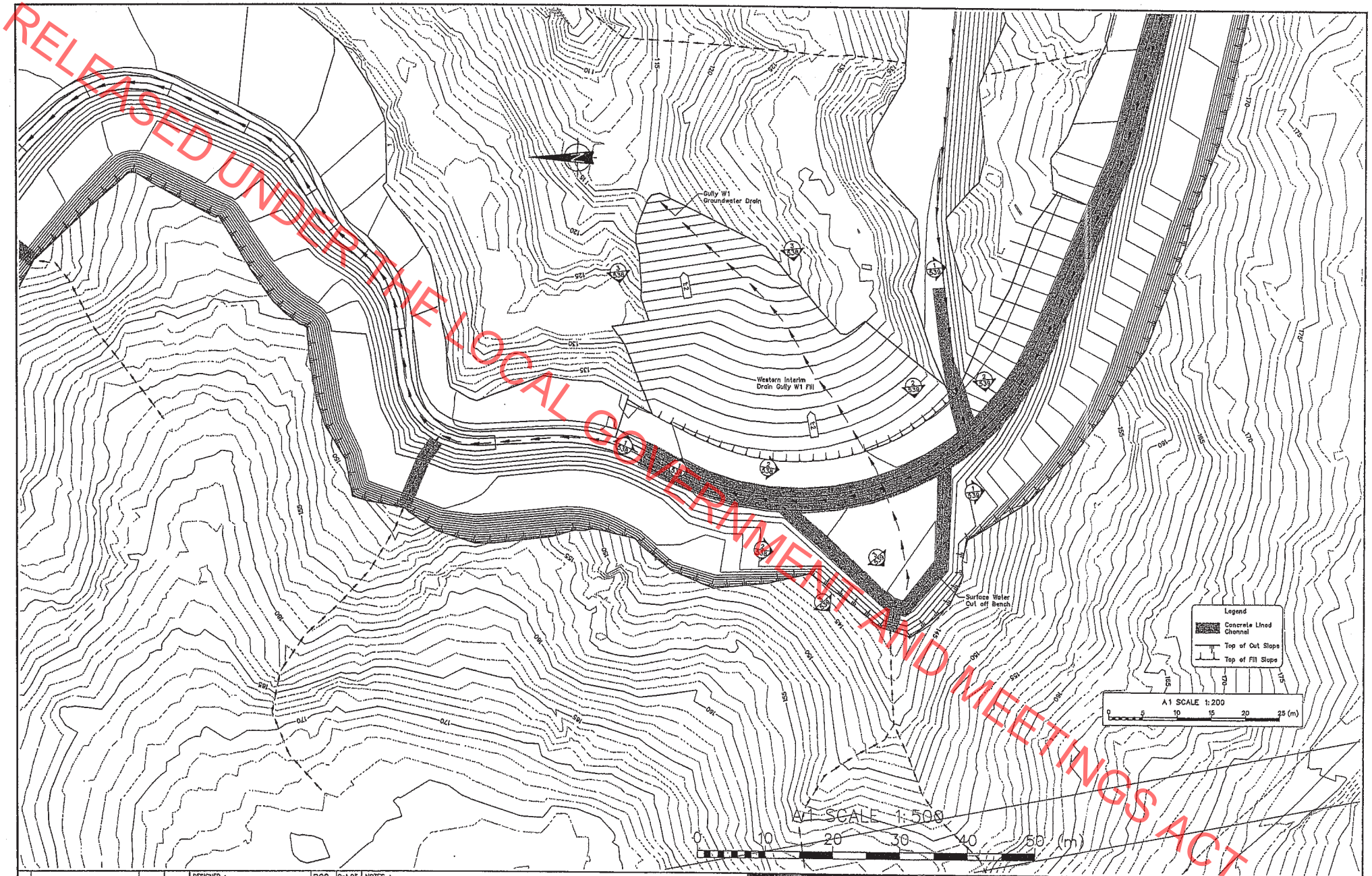
Auckland Christchurch Hamilton Whangarei Nelson

HUTT CITY
SILVERSTREAM LANDFILL
SS2 Contract: AD 16 3559
TITLE
WESTERN PERIMETER SURFACE WATER SYSTEM
Western Interim Drain – Typical Fill Section
SCALES (AT A1 SIZE) 1: 100
DWG. No. 8309 1.300-SUR536
REV. B

I:\8309\1\300\8309\1.300-SUR536.dwg, 536, 17/01/2008 3:00:51 p., rgc, b&w A3 laser.pc3, A3 (297 x 420 mm), 1:2

RELEASED UNDER THE LOCAL GOVERNMENT AND MEETINGS ACT 1987



REVISION	DESCRIPTION	BY	DATE
B	Construction Issue		06
A	Tender Issue		

DESIGNED :	RGC	Oct.05
DRAWN :	NRM	Oct.05
DESIGN CHECKED :		11/06
DRAFTING CHECKED :		11/06
CADFILE : L:\83091\300\SUR523-526.dwg		
APPROVED :		

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NOTES :
1. All dimensions are in millimetres unless noted otherwise.
2. Existing ground contours created from Airborne Laser Scanning data flown 2 August 2005. Data provided by AAMHATCH Pty Ltd, Reference: 2 10 11 190 1nob.
3. Coordinates:
Coordinate Datum: NZ Geodetic 1949 Wellington Circuit Coordinates
Origin: Mt Cook 700,000 mN 300,000 mE
Level Datum: LINZ (MSL)

REFERENCE :

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Environmental & Engineering Consultants
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Email : wel@tonkin.co.nz
Auckland Christchurch Nelson

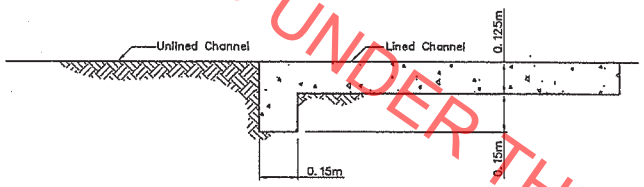
HUTT CITY

TITLE
SILVERSTREAM LANDFILL
SS2 Contract: AD 16-3559
WESTERN PERIMETER SURFACE WATER SYSTEM
Western Interim Drain Gully W1 Fill Details

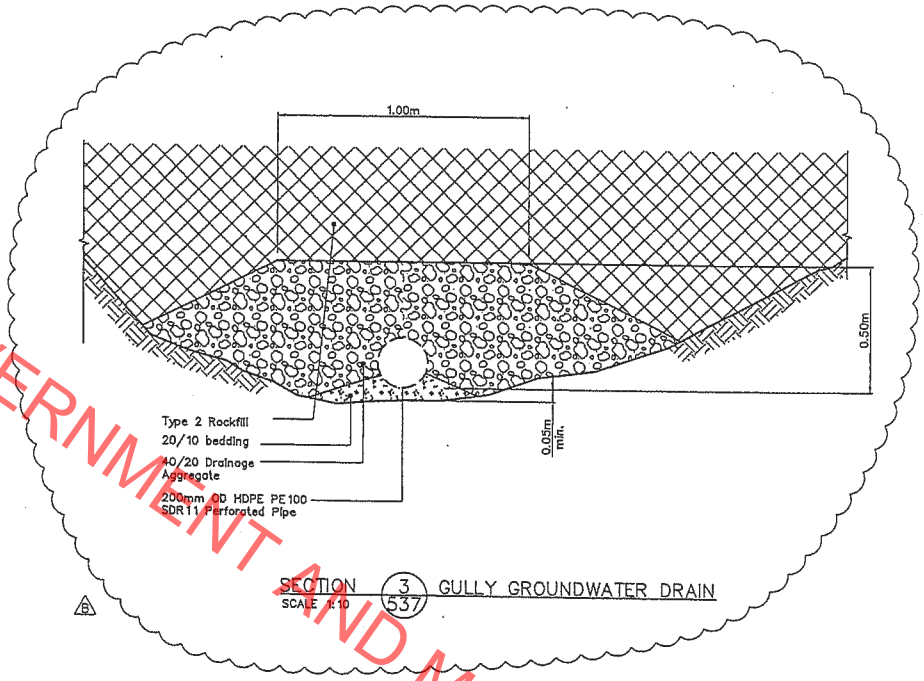
SCALES (AT A1 SIZE)	DWG. No.	REV.
00	8309 -SUR	B

[R:\83091\300\83091.300-SUR523-526.dwg, SUR537, 17/07/2006 3:00:59 p., rgc, DRW A3 laser.pc3, A3 (297 x 420 mm), 1:2

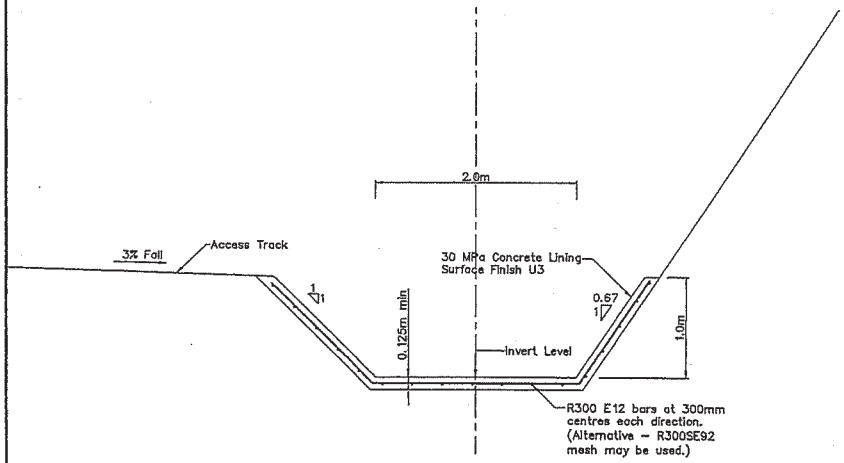
RELEASED UNDER THE LOCAL GOVERNMENT AND MEETINGS ACT 1987



SECTION 1/537 START OF LINED SECTION OF CHANNEL
SCALE 1:10



SECTION 3/537 GULLY GROUNDWATER DRAIN
SCALE 1:10



DETAIL A/535 LINED CHANNEL DETAIL
SCALE 1:25

REVISION DESCRIPTION	BY	DATE
C Construction Issue		
B Groundwater drain modified		
A Tender Issue		

DESIGNED : RGC Nov.05
DRAWN : NRM Nov.05
DESIGN CHECKED :
DRAFTING CHECKED :
CADFILE : L:\8309 1\300\8309 1.300-SUR538.dwg
APPROVED :

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NOTES :
1. All dimensions are in millimetres unless noted otherwise.
2. All reinforcing steel shall have a minimum cover of 75mm from the surface in contact with the ground.
3. Extent of channel lining to be confirmed on site by Engineer.

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Auckland Christchurch Hamilton Whangarei Nelson

HUTT CITY

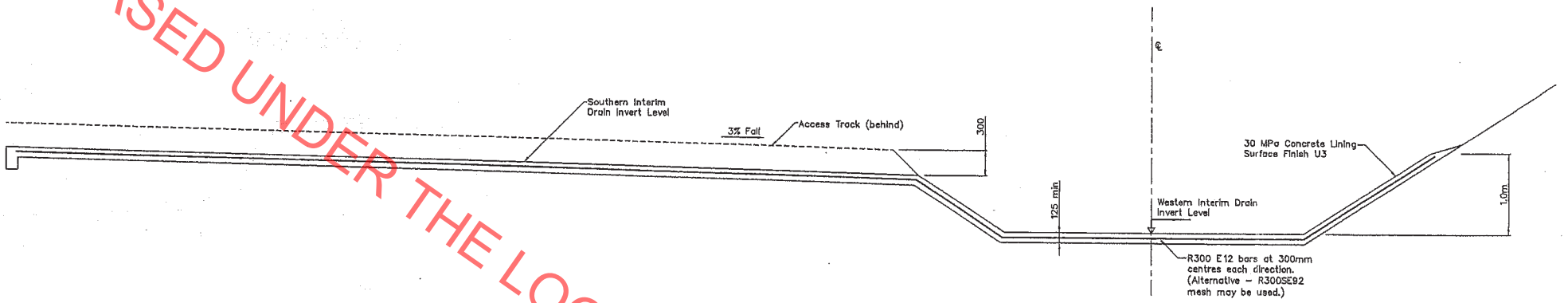
SILVERSTREAM LANDFILL
SS2 Contract: AD 16 3559

TITLE
WESTERN PERIMETER SURFACE WATER SYSTEM
Western Interim Drain Details (Sheet 1 of 3)

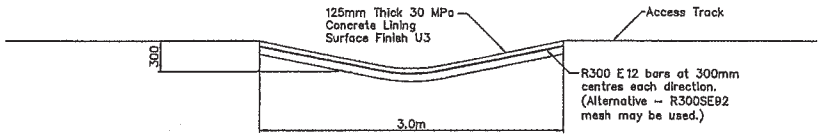
SCALES (AT A1 SIZE) As Shown
DWG. No. 8309 1.300-SUR538
REV. C

L:\8309\1\300\8309 1.300-SUR538.dwg, 538, 17/01/2006 3:01:04 p., rgc, b&w A3 laser.pc3, A3 (297 x 420 mm), 1:2

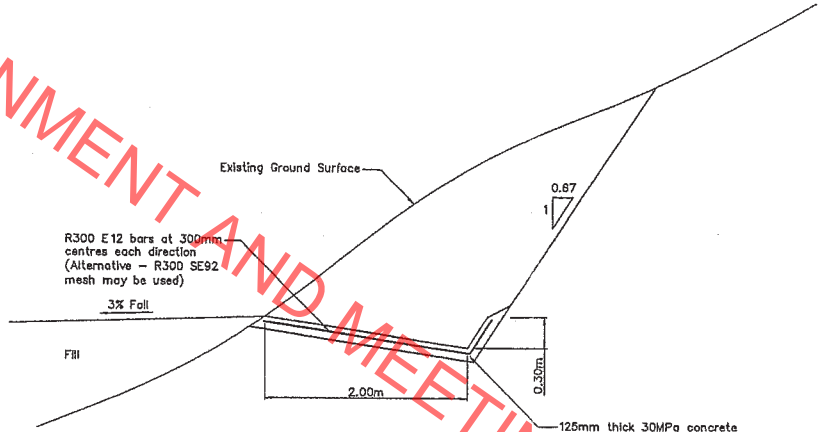
RELEASED UNDER THE LOCAL GOVERNMENT AND MEETINGS ACT 1987



SECTION 1/537 SCALE 1:25 — SOUTHERN DRAIN CONNECTION TO WESTERN INTERIM DRAIN



SECTION 2/537 SCALE 1:25 — SOUTHERN DRAIN CONNECTION TO WESTERN INTERIM DRAIN



SECTION 3/537 SCALE 1:25 — SURFACE WATER CUT OFF BENCH

A1 SCALE 1:25
0 0.5 1.0 1.5 2.0 2.5 (m)

REVISION DESCRIPTION	BY	DATE
B Construction Issue		6/11/06
A Tender Issue		

DESIGNED : RGC Nov.05
DRAWN : NRM Nov.05
DESIGN CHECKED : 6/11/06
DRAFTING CHECKED : 6/11/06
CADFILE : L:\8309 1\300\8309 1.300-SUR539.dwg
APPROVED : 17/11/06
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REFERENCE :

NOTES :
1. All dimensions are in millimetres unless noted otherwise.
2. All reinforcing steel shall have a minimum cover of 75mm from the surface in contact with the ground.
3. Extent of channel lining to be confirmed on site by Engineer.

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HUTT CITY

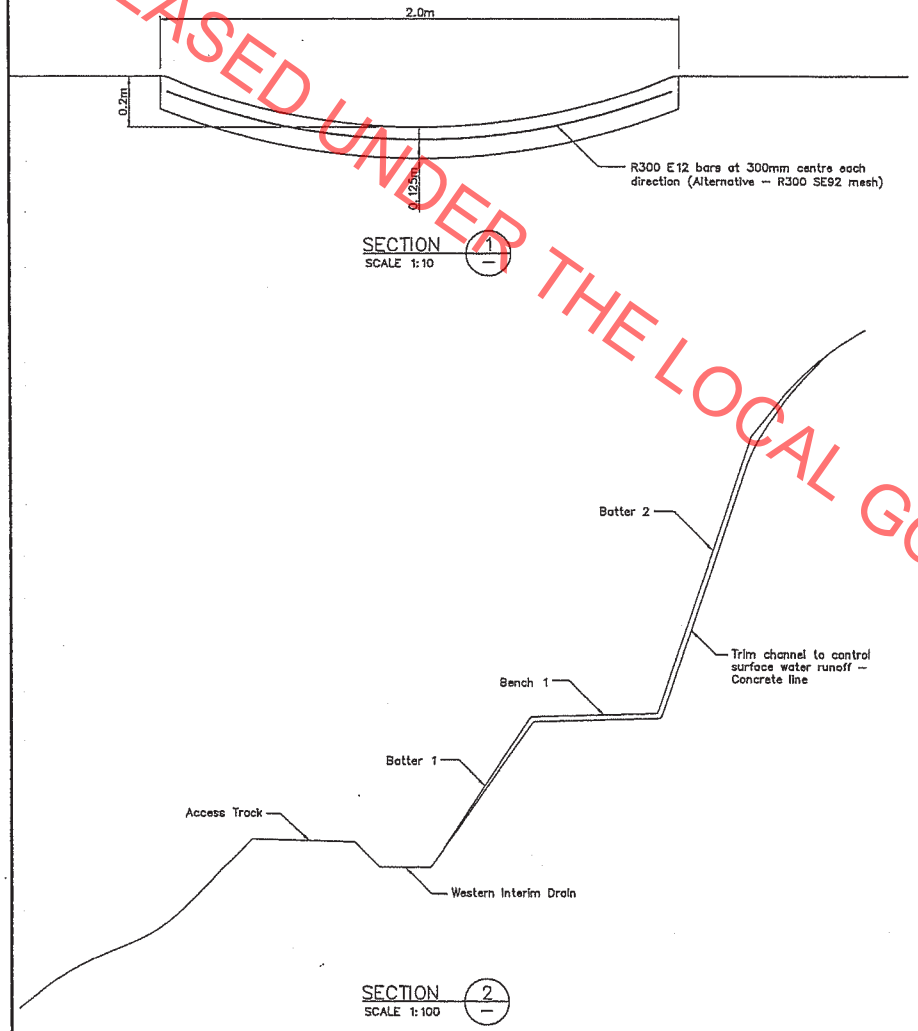
SILVERSTREAM LANDFILL
SS2 Contract: AD 16 3559

TITLE
WESTERN PERIMETER SURFACE WATER SYSTEM
Western Interim Drain Details (Sheet 2 of 3)

SCALES (AT A1 SIZE) 1: 25
DWG. No. 8309 1.300-SUR539
REV. B

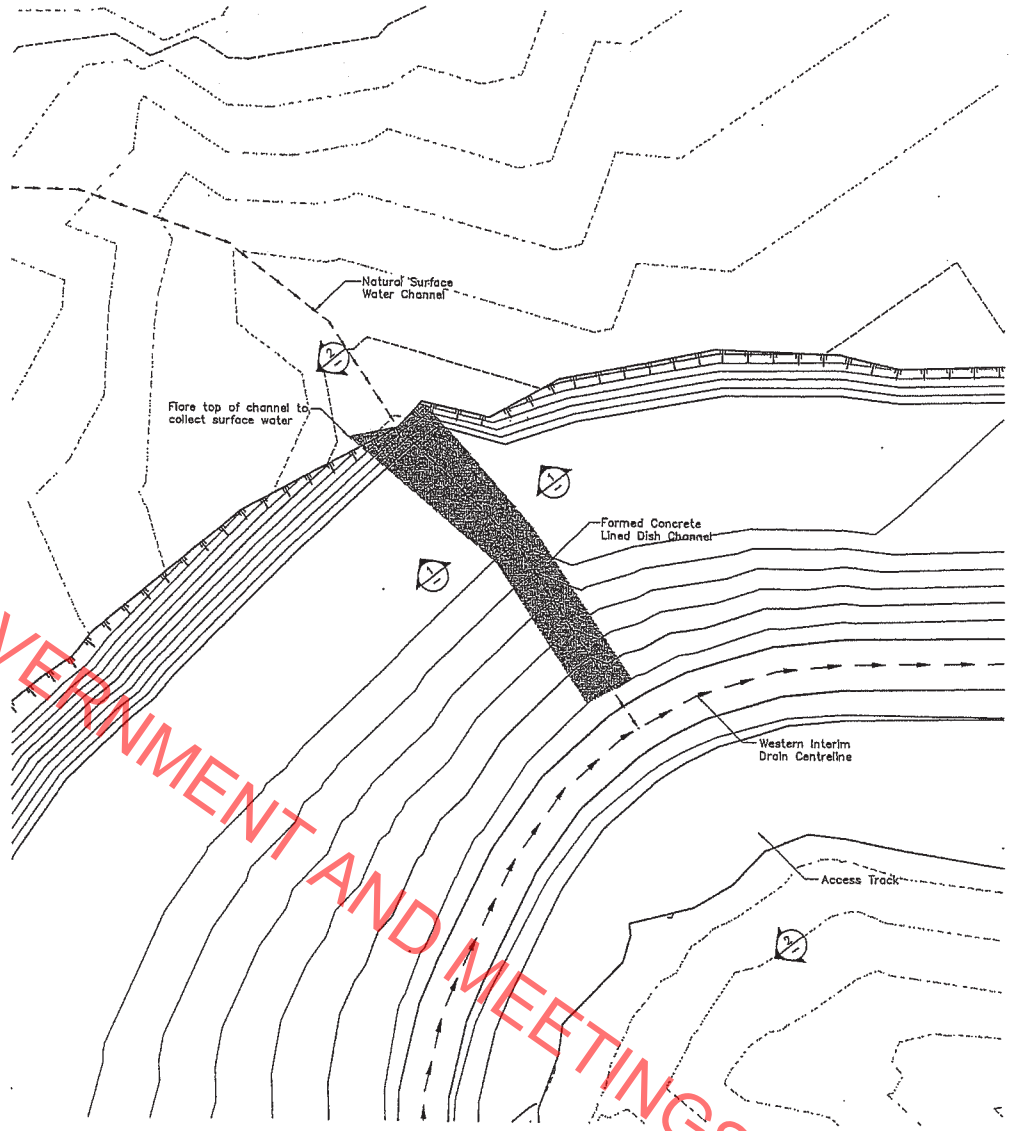
I:\8309\1300\8309\1.300-SUR539.dwg, SUR539, 17/01/2008 3:01:10 p., rgc, b&w A3 laser.pc3, A3 (297 x 420 mm), 1:2

RELEASED UNDER THE LOCAL GOVERNMENT AND MEETINGS ACT 1987



SECTION 1 — SCALE 1:10

SECTION 2 — SCALE 1:100



DETAIL A — TYPICAL CONCRETE LINED SURFACE WATER CHANNEL — SCALE 1:100 — 526

REVISION	DESCRIPTION	BY	DATE
B	Construction Issue		17/10/06
A	Tender Issue		

DESIGNED : RGC Nov.05
DRAWN : NRM Nov.05
DESIGN CHECKED :
DRAFTING CHECKED :
CADFILE : L:\8309 1\300\8309 1.300–SUR539.dwg
APPROVED : 17/10/06

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NOTES :
1. All dimensions are in metres unless noted otherwise.
2. All reinforcing steel shall have a minimum cover of 75mm from the surface in contact with the ground.
3. Concrete lining not required for channel locations in MW or less weathered rock at the direction of the Engineer.

REFERENCE :

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Tel. (04) 381 8560 Fax. (04) 381 2908
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HUTT CITY

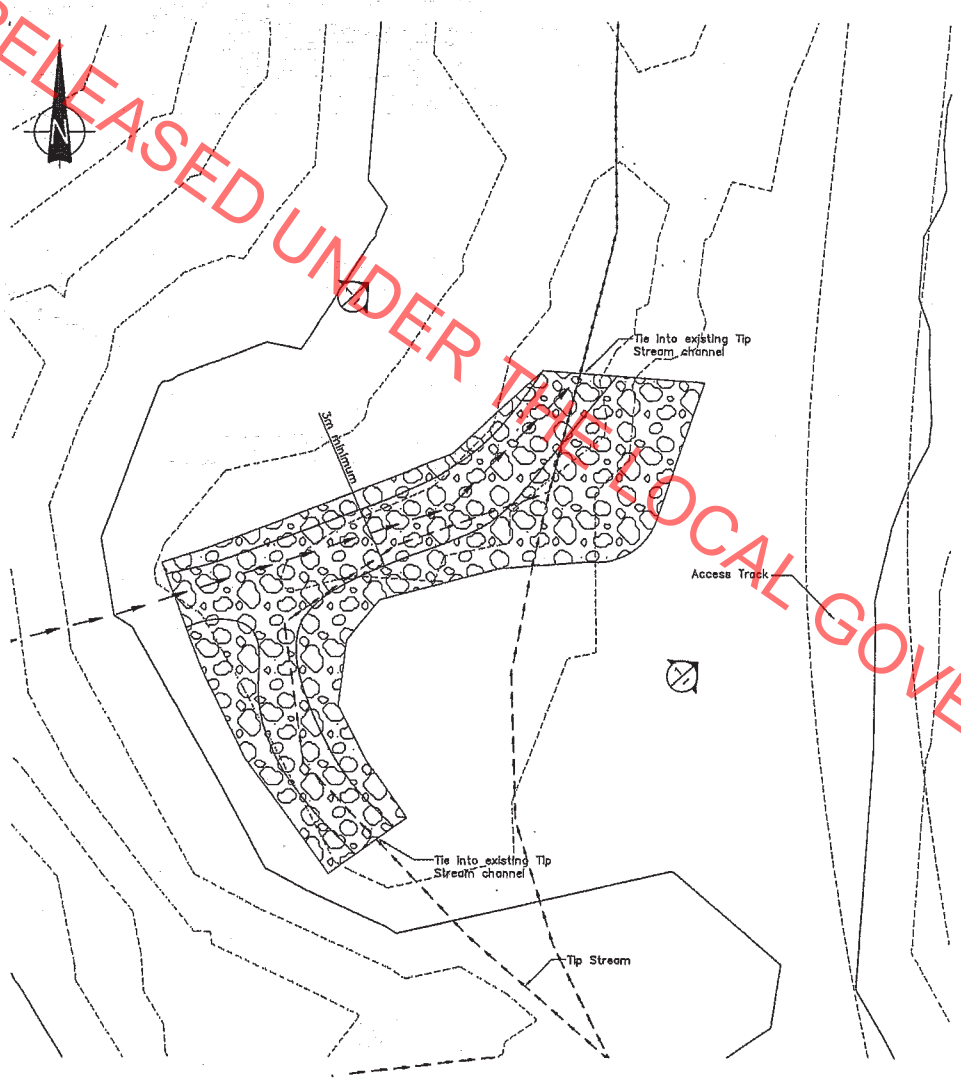
SILVERSTREAM LANDFILL
SS2 Contract: AD 16 3559

TITLE
WESTERN PERIMETER SURFACE WATER SYSTEM
Western Interim Drain Details (Sheet 3 of 3)

SCALES (AT A1 SIZE) 1:25
DWG. No. 8309 1.300–SUR540
REV. B

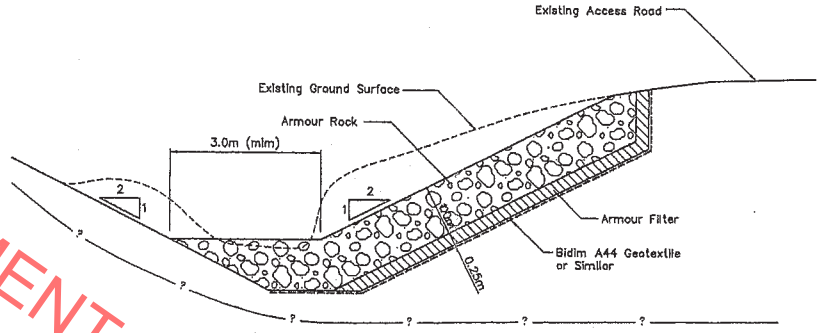
I:\8309\1\300\8309 1.300-SUR540.dwg, SUR540, 17/01/2008 3:01:20 p., rgc, b&w A3 laser.pc3, A3 (297 x 420 mm), 1:2

RELEASED UNDER THE LOCAL GOVERNMENT AND MEETINGS ACT 1987



DETAIL A 526 WESTERN INTERIM DRAIN OUTLET
SCALE 1:100

A1 SCALE 1:100
0 1 2 3 4 6 8 10 (m)



SECTION 1 TYPICAL ROCK ARMOUR AT WESTERN INTERIM DRAIN OUTLET
SCALE 1:50

A1 SCALE 1:50
0 1 2 3 4 5 (m)

REVISION	DESCRIPTION	BY	DATE
B	Construction Issue		17/1/06
A	Tender Issue		

DESIGNED : RGC Nov.05
DRAWN : NRM Nov.05
DESIGN CHECKED : 17/1/06
DRAFTING CHECKED : 17/1/06
CADFILE : L:\83091\300\83091.300-SUR539.dwg
APPROVED : 17/1/06
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NOTES :
1. All dimensions are in metres unless noted otherwise.

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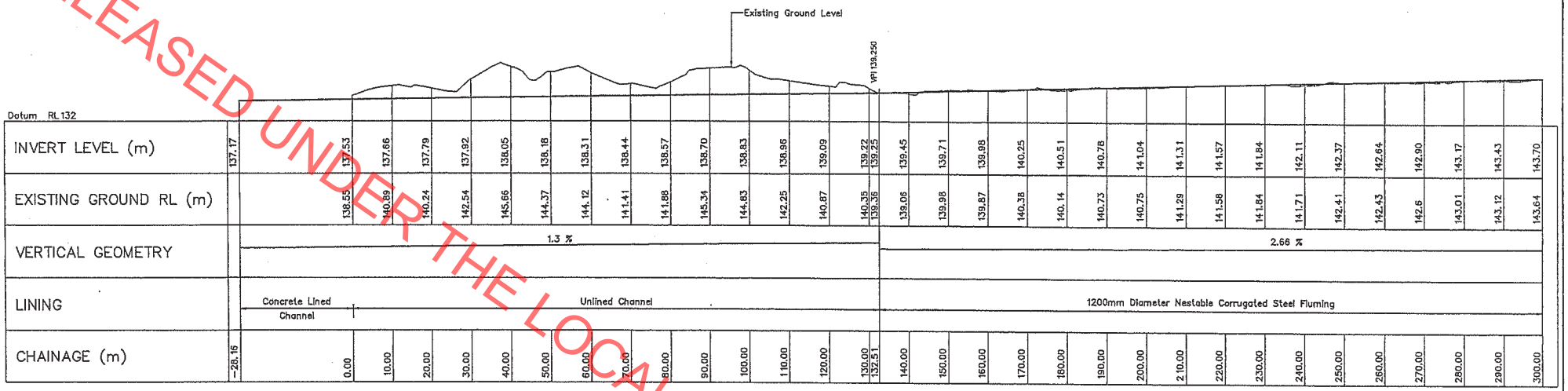
HUTT CITY
SILVERSTREAM LANDFILL
SS2 Contract: AD 16 03559

TITLE
WESTERN PERIMETER SURFACE WATER SYSTEM
Western Interim Drain Outlet Details

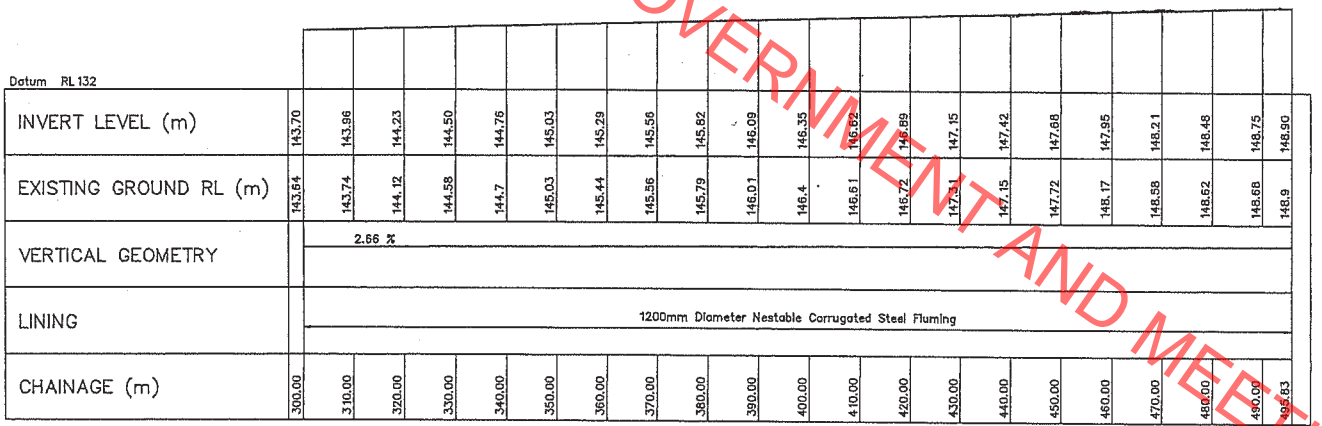
SCALES (AT A1 SIZE) Shov
DWG. No. 8309 -SUR REV. B

K:\83091\300\83091.300-SUR541.dwg, SUR541, 17/01/2006 3:01:29 p., rgs, b&w A3 laser.pc3, A3 (297 x 420 mm), 1:2

RELEASED UNDER THE LOCAL GOVERNMENT AND MEETINGS ACT 1987



SECTION — SOUTHERN INTERIM DRAIN LONGSECTION
SCALE 1:500 (524)



SECTION — SOUTHERN INTERIM DRAIN LONGSECTION
SCALE 1:500 (524)

A1 SCALE 1:500
0 10 20 30 40 50 (m)

REVISION	DESCRIPTION	BY	DATE
B	Construction Issue		1/06
A	Tender Issue		

DESIGNED : RGC Nov.05
DRAWN : NRM Nov.05
DESIGN CHECKED : 1/06
DRAFTING CHECKED : 1/06
CADFILE : L:\8309 1\300\8309 1.300-SUR542-543
APPROVED : 18/1/06

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NOTES :
1. Existing ground level based on Airbourne Laser Scanning data, flown 2 August 2005. Data provided by AAMHATCH Pty Ltd, Reference 210111190mab.
2. Refer drawing 8309 1.300-SUR524 for location of drain.

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Email : well@tonkin.co.nz
Auckland Christchurch Hamilton Whangarei Nelson

HUTT CITY

SILVERSTREAM LANDFILL
SS2 Contract: AD 16 3559

TITLE
WESTERN PERIMETER SURFACE WATER SYSTEM
Southern Interim Drain Longsection

SCALES (A1 A3 SIZE) 1:500
DWG. No. 8309 1.300-SUR542
REV. B

L:\8309\300\8309 1.300-SUR542-543.dwg, 542, 18/01/2006 9:33:17 a.m., Nwell, 1:1 Wel Plot A1 BRW, A3 (297 x 420 mm), 0.000370113

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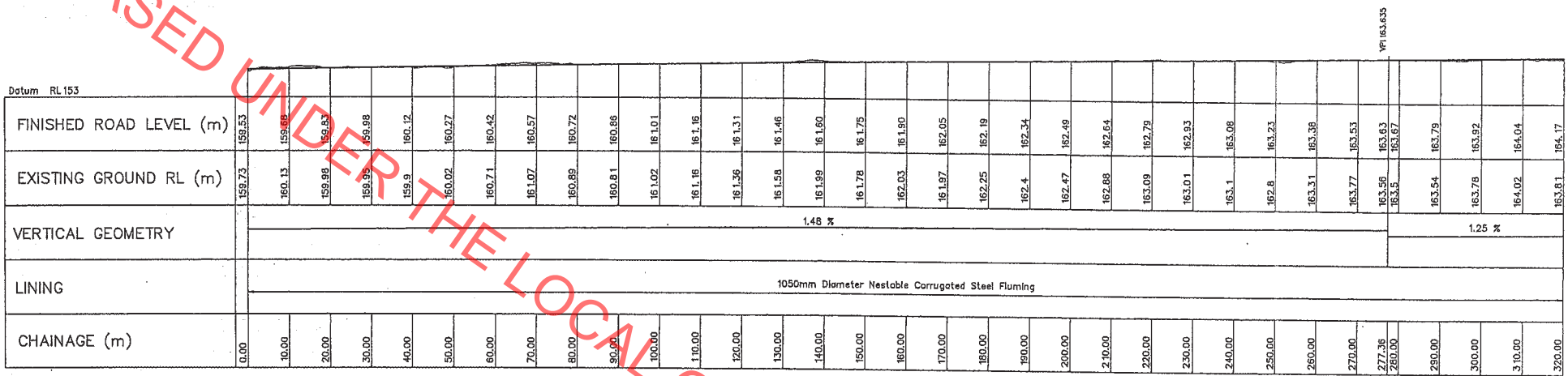
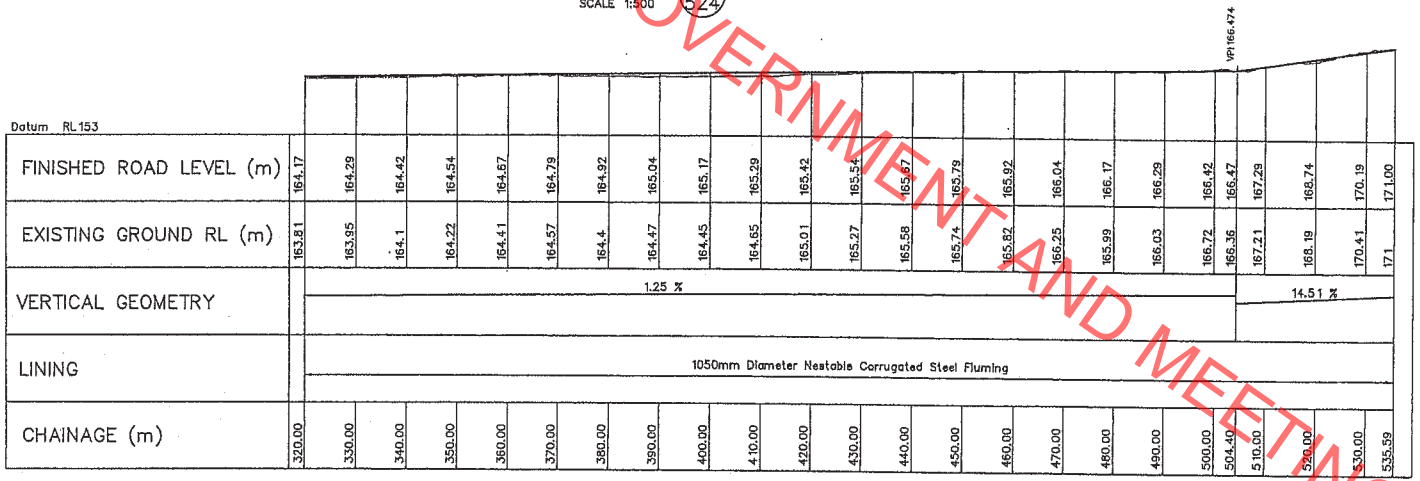


SECTION 524 STAGE 1a INTERIM DRAIN LONGSECTION
SCALE 1:500



SECTION 524 STAGE 1a INTERIM DRAIN LONGSECTION
SCALE 1:500

A1 SCALE 1:500
0 10 20 30 40 50 (m)

DESIGNED :	RGC	Nov.05	
DRAWN :	NRM	Nov.05	
DESIGN CHECKED :		1/06	
DRAFTING CHECKED :		1/06	
CADFILE : L:\8309 1\300\8309 1.300-SUR542-543			
APPROVED :		1/06	
B Construction Issue		1/06	
A Tender Issue			
REVISION DESCRIPTION	BY	DATE	

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SILVERSTREAM LANDFILL
SS2 Contract: AD 16 3559

TITLE
WESTERN PERIMETER SURFACE WATER SYSTEM
Stage 1a Interim Drain Longsection

SCALES (AT A1 SIZE) 1:500
DWG. No. 8309 -SUR
REV. B

K:\8309\300\8309\300-SUR542-543.dwg, 543, 17/01/2006 3:01:38 p., rgc, b&w A3 laser.pc3, A3 (297 x 420 mm), 1:2

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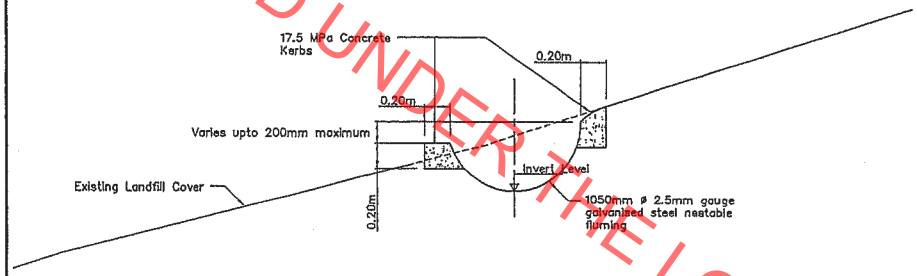
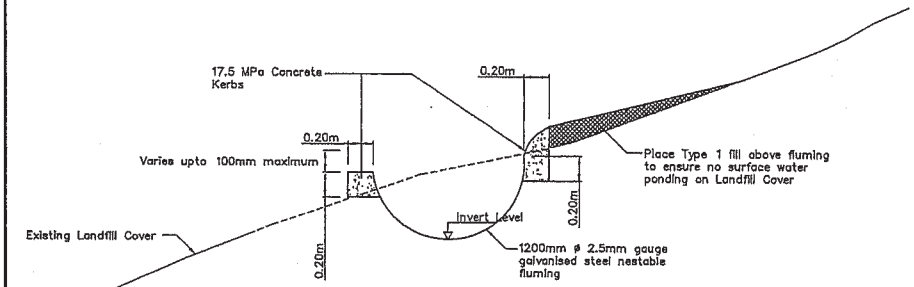
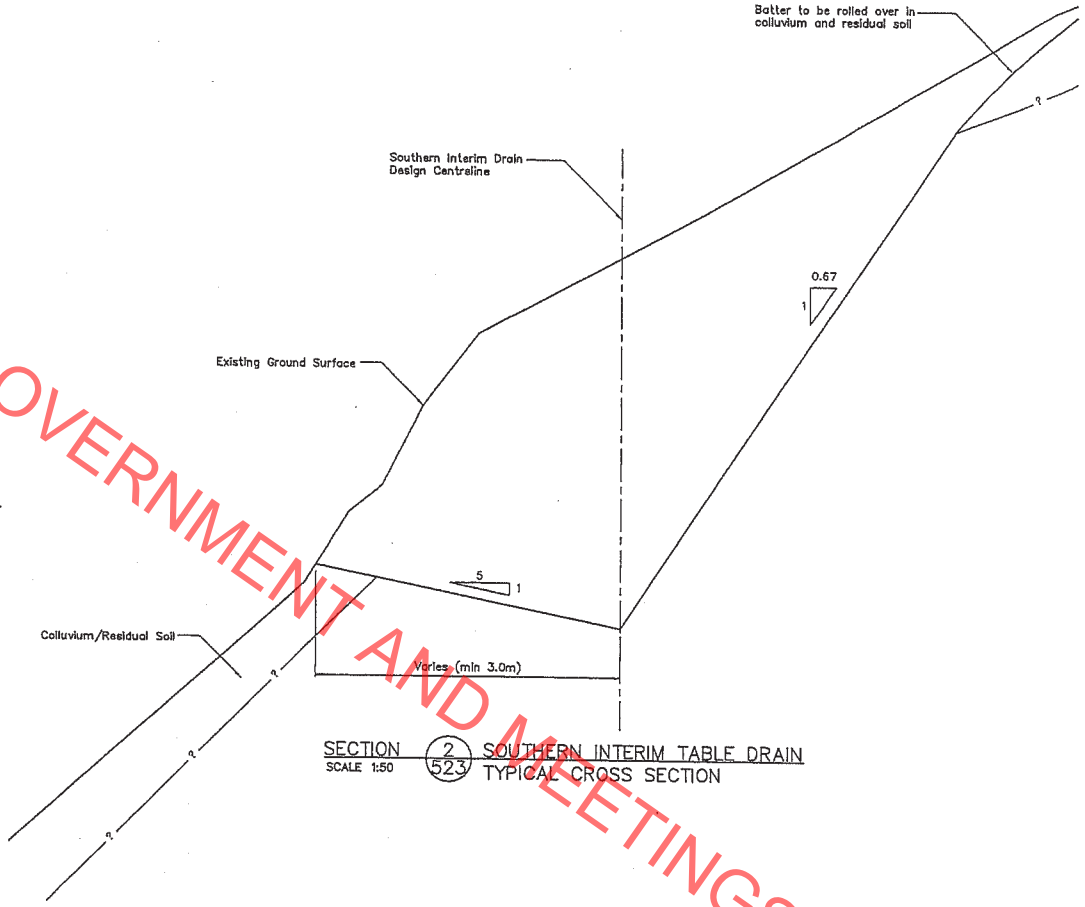


SECTION 2/524 SCALE 1:20 — SOUTHERN INTERIM DRAIN FLUME TYPICAL CROSS SECTION



SECTION 1/524 SCALE 1:20 — STAGE 1a INTERIM DRAIN FLUME TYPICAL CROSS SECTION



SECTION 2/523 SCALE 1:50 — SOUTHERN INTERIM TABLE DRAIN TYPICAL CROSS SECTION

A1 SCALE 1:20
0 0.5 1.0 1.5 2.0 2.5(m)

A1 SCALE 1:50
0 1 2 3 4 5 (m)

REVISION DESCRIPTION	BY	DATE
B Construction Issue		
A Tender Issue		

DESIGNED : RGC Nov.05
DRAWN : NRM Nov.05
DESIGN CHECKED : RGC
DRAFTING CHECKED : RGC
CADFILE : L:\83091\300\8309 1.300-SUR537.dwg
APPROVED : 17/1/06
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Auckland Christchurch Hamilton Whangarei Nelson

HUTT CITY

SILVERSTREAM LANDFILL
SS2 Contract: AD 16 3559

TITLE
WESTERN PERIMETER SURFACE WATER SYSTEM
Southern Interim & Stage 1a Drain Details

SCALES (AT A1 SIZE) As Shown
DWG. No. 8309 1.300-SUR544
REV. B

I:\83091\300\83091.300-SUR544.dwg, 544, 17/01/2006 3:01:43 p., rgc, b&w A3 laser.pc3, A3 (297 x 420 mm), 1:2

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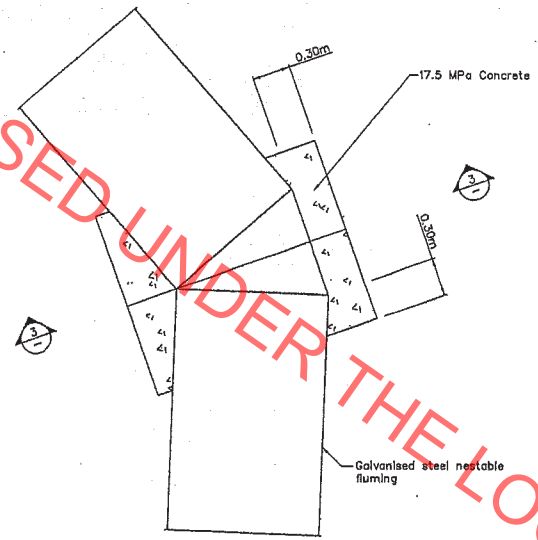
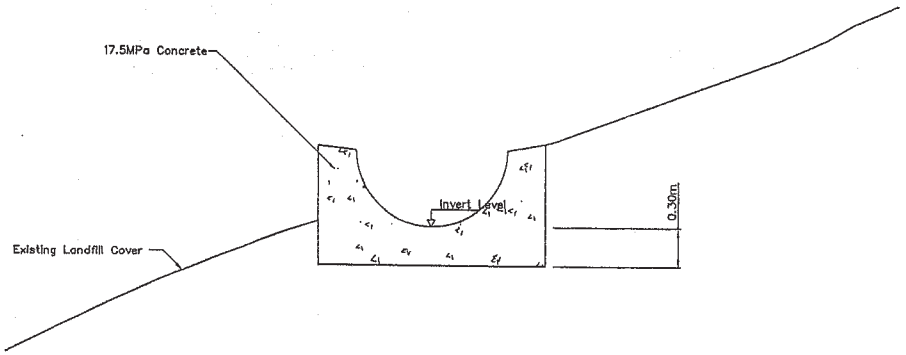
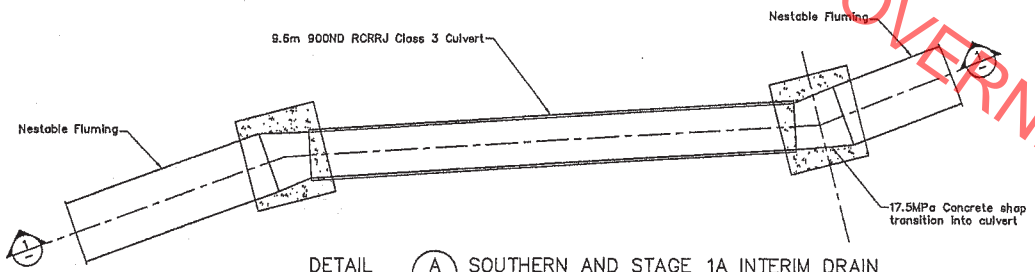


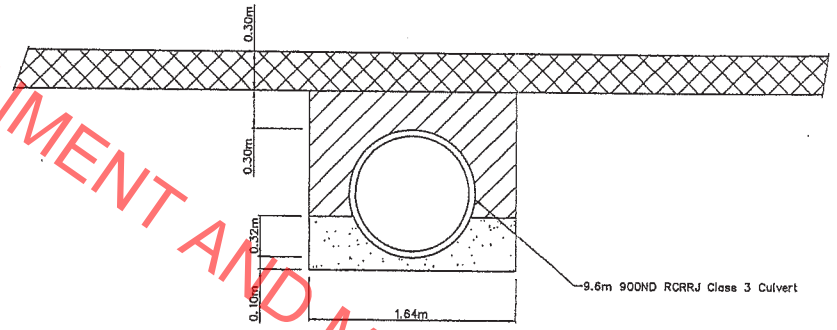
DETAIL SCALE 1:20 — B 524 — SOUTHERN AND STAGE 1A INTERIM DRAIN FLUME BEND

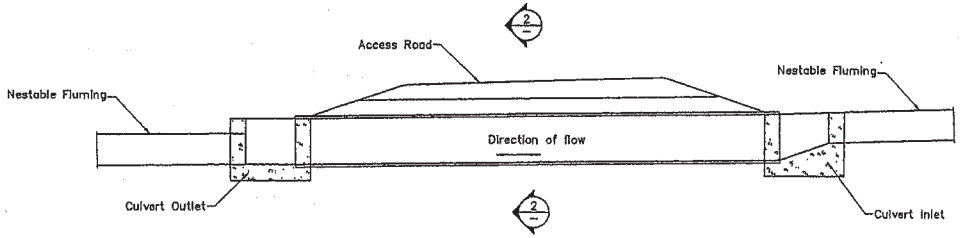


SECTION SCALE 1:20 — 3 — SOUTHERN AND STAGE 1A INTERIM DRAIN FLUME BEND



DETAIL SCALE 1:50 — A 524 — SOUTHERN AND STAGE 1A INTERIM DRAIN ACCESS ROAD CULVERT





SECTION SCALE 1:20 — 2 — SOUTHERN AND STAGE 1A INTERIM DRAIN CULVERT BEDDING

A1 SCALE 1:50 (0 1 2 3 4 5 (m))

SECTION SCALE 1:50 — 1 — SOUTHERN AND STAGE 1A INTERIM DRAIN ACCESS ROAD CULVERT

A1 SCALE 1:20 (0 0.5 1.0 1.5 2.0 2.5(m))

REVISION DESCRIPTION	BY	DATE
B Construction Issue		1/06
A Tender Issue		

DESIGNED : RGC Nov.05
DRAWN : RGC Nov.05
DESIGN CHECKED : 1/06
DRAFTING CHECKED : 1/06
CADFILE : L:\8309\1\300\8309 1.300-SUR537.dwg
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HUTT CITY
SILVERSTREAM LANDFILL
SS2 Contract: AD 16 3559
TITLE
WESTERN PERIMETER SURFACE WATER SYSTEM
Southern Interim & Stage 1a Drain Details
SCALES (AT A1 SIZE) Shov
DWG. No. 8309 -SUF
REV. B

I:\8309\1\300\8309\1.300-SUR545.dwg, 545, 17/01/2006 3:01:48 p., rgc, b&w A3 laser.pc3, A3 (297 x 420 mm), 1:2

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IT	7 15984.09	3 18 132.93	56.453
IT840	7 15727.41	3 18324.50	73. 193
IT876	7 16085.91	3 18 157.73	58.296
IT877	7 15846.26	3 18 170.60	63.62
IT910	7 15911.63	3 18 190.04	94.738
O.I.R. 11	7 14916.06	3 18536.03	174.29
OIT 15	7 15345.49	3 18558.32	153.29
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Survey Mark 2	7 15621.95	3 18458.86	136.25
Survey Mark 3	7 15788.14	3 18396.47	117.76
Survey Mark 4	7 15863.22	3 18323.07	108.85
Survey Mark 5	7 15886.50	3 18217.71	99.76
Survey Mark 6	7 15922.78	3 18 194.70	96.25
Survey Mark 7	7 15943.43	3 18213.98	94.14
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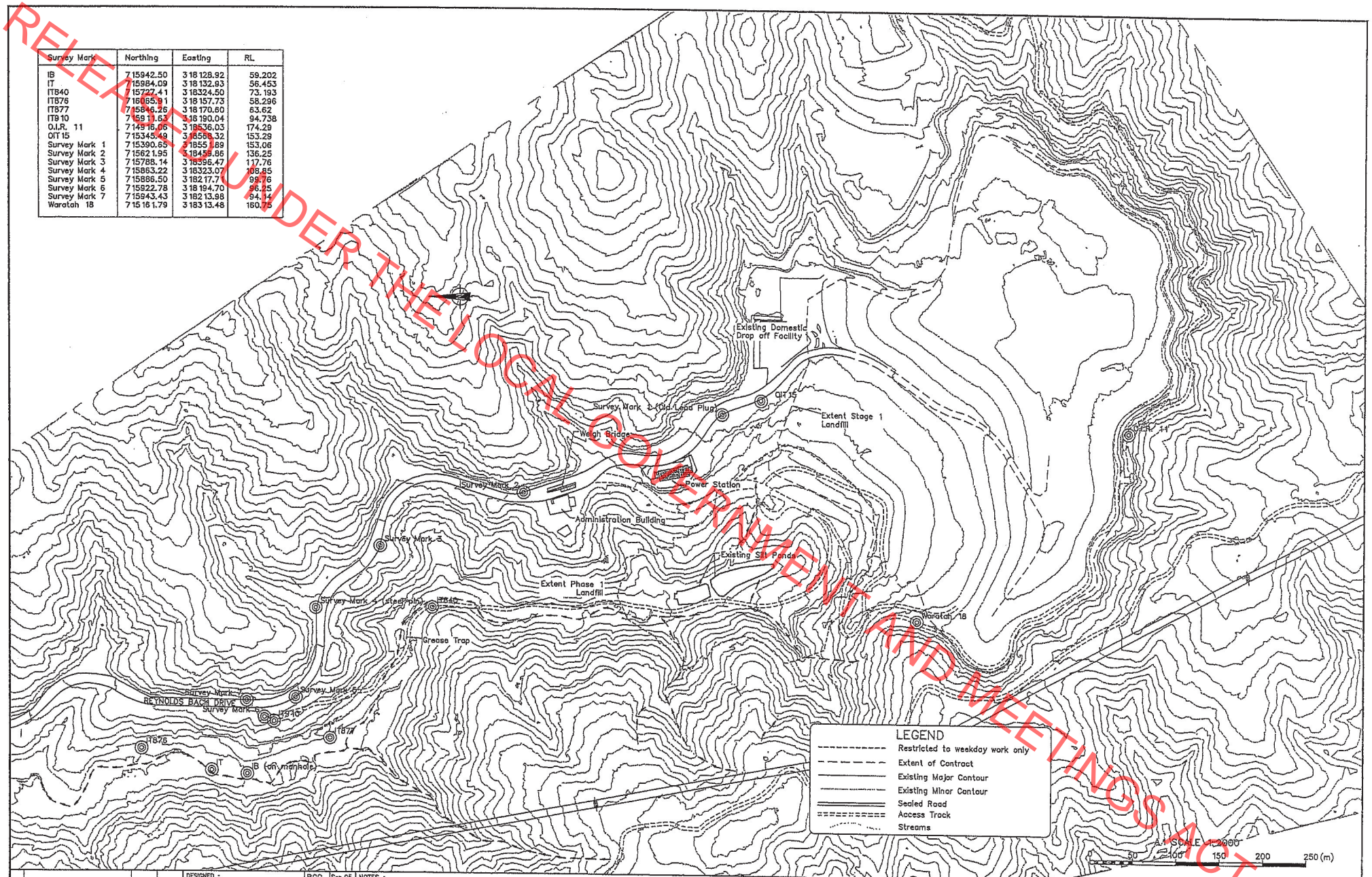

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		DESIGN CHECKED :	17/1/06
		DRAFTING CHECKED :	17/1/06
		CADFILE : L:\8309 1\300\8309 1.300-SUR502.dwg	
B	Construction Issue	APPROVED :	17/1/06
A	Tender Issue	GIW Oct 05	This drawing is not to be used for construction purposes unless signed as approved
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NOTES :
1. All dimensions are in millimetres unless noted otherwise.
2. Existing ground contours created from Airborne Laser Scanning data flown 2 August 2005. Data provided by AAMHATCH Pty Ltd, Reference: 2 10 11 190 Inab.
3. Coordinates:
   Coordinate Datum: NZ Geodetic 1949 Wellington Circuit Coordinates
   Origin: Mt Cook 700,000 mN 300,000 mE
   Level Datum: LINZ (MSL)

REFERENCE :

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HUTT CITY

SILVERSTREAM LANDFILL
SS2 Contract: AD16-3558

TITLE
EASTERN PERIMETER SURFACE WATER SYSTEM
EXISTING SURVEY CONTROL

SCALES (AT A1 SIZE) 1: 2000

DWG. No. 8309 1.300-SET701 REV. B

I:\83091\300\8309 1.300-SUR502.dwg, 701, 17/01/2006 3:02:10 p., tgg, b&w A3 laser.pcs, A3 (297 x 420 mm), 1:2

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Appendix I: **Phase 1 Base, Slopes 1 & 2**
Drawings – 83091.400

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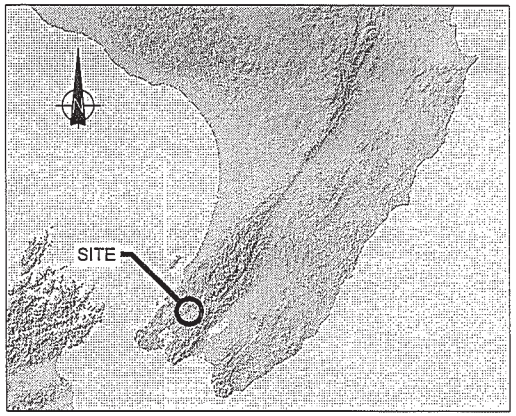
Drawing List

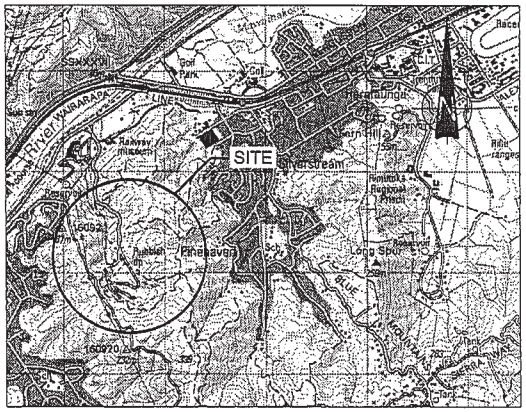
Sheet	Rev	Title
General		
• 83091.400-GEN001	1	Drawing List & Locality Plan
• 83091.400-GEN002	A	Abbreviations & Terminology
• 83091.400-GEN003	A	Project Plan
• 83091.400-GEN004	A	Stockpile and Borrow Area Location Plan
Phase 1 Formation		
• 83091.400-FOR101	A	Existing Contours
• 83091.400-FOR102	A	HDPE Geomembrane Liner Level
• 83091.400-FOR103	A	Base of Unsuitables
• 83091.400-FOR104	A	Groundwater Drainage Plan (sheet 1 of 2)
• 83091.400-FOR105	A	Groundwater Drainage Plan (sheet 2 of 2)
• 83091.400-FOR106	A	Cross Sections (sheet 1 of 3)
• 83091.400-FOR107	A	Cross Sections (sheet 2 of 3)
• 83091.400-FOR108	A	Cross Sections (sheet 3 of 3)
• 83091.400-FOR109	A	Geogrid Rockfill Slope (sheet 1 of 2)
• 83091.400-FOR110	A	Geogrid Rockfill Slope (sheet 2 of 2)
• 83091.400-FOR111	A	Rock Bolt and Sprayed Concrete Supported Slope
• 83091.400-FOR112	A	Groundwater Drainage Details
• 83091.400-FOR113	A	Access Road Plan
• 83091.400-FOR114	A	Access Road Longitudinal Section
• 83091.400-FOR115	A	Access Road Cross Sections
Phase 1 Liner		
• 83091.400-LNR201	A	Liner Layout Plan
• 83091.400-LNR202	A	Liner Types
• 83091.400-LNR203	A	Liner Details (sheet 1 of 4)
• 83091.400-LNR204	A	Liner Details (sheet 2 of 4)
• 83091.400-LNR205	A	Liner Details (sheet 3 of 4)
• 83091.400-LNR206	A	Liner Details (sheet 4 of 4)

Sheet	Rev	Title
Phase 1 Leachate Drainage System		
• 83091.400-LCS301	A	Existing Leachate Drainage Plan
• 83091.400-LCS302	A	Leachate Collection System Plan
• 83091.400-LCS303	A	Leachate Drainage Details
Phase 1 Toe Bund		
• 83091.400-TOE401	A	Completed Enabling Works
• 83091.400-TOE402	A	Toe Bund Plan
• 83091.400-TOE403	A	Toe Bund Internal Drainage Plan
• 83091.400-TOE404	A	Toe Bund Section (sheet 1 of 2)
• 83091.400-TOE405	A	Toe Bund Section (sheet 2 of 2)
• 83091.400-TOE406	A	Toe Bund Details (sheet 1 of 5)
• 83091.400-TOE407	A	Toe Bund Details (sheet 2 of 5)
• 83091.400-TOE408	A	Toe Bund Details (sheet 3 of 5)
• 83091.400-TOE409	A	Toe Bund Details (sheet 4 of 5)
• 83091.400-TOE410	A	Toe Bund Details (sheet 5 of 5)
Survey Control		
• 83091.400-SET501	A	Existing Survey Control

• Drawings this issue 18 July 2006



LOCATION PLAN
NOT TO SCALE



SITE LOCATION
SCALE 1: 250,000

Sourced from Land Information New Zealand data
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A1 SCALE 1:25,000
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REVISION	DESCRIPTION	BY	DATE
1	Tender Issue		

DESIGNED : SJS May.06
DRAWN : FFAN May.06
DESIGN CHECKED :
DRAFTING CHECKED :
CADFILE : P:\8309 1\..\8309 1.400-GEN00 1
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HUTT CITY

SILVERSTREAM LANDFILL
SS2 Contract: AD 16 3624

TITLE
PHASE 1 BASE, SLOPES 1 & 2
Drawing List & Locality Plan

SCALES (AT A1 SIZE) AS SHOWN
DWG. No. 8309 1.400-GEN00 1
REV. 1

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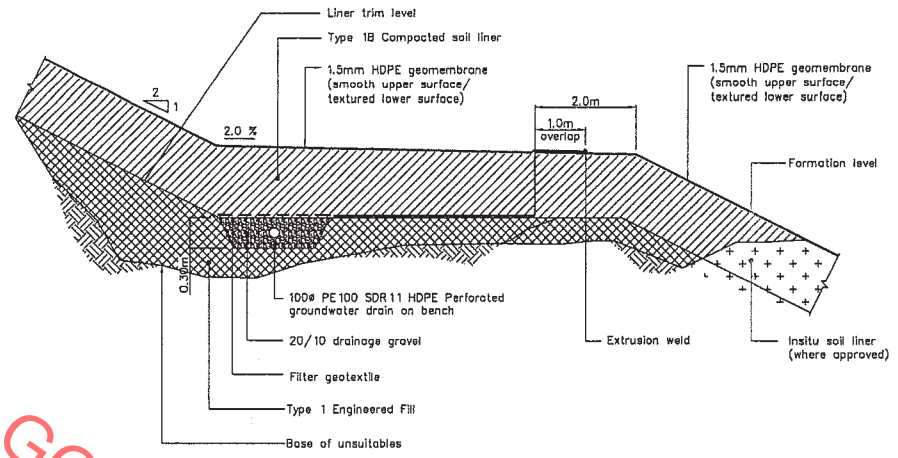
DRAWING ABBREVIATIONS

Abbreviation	Explanation
℄	Centreline
ø, dia	Diameter
AC	Asbestos cement
B	Bottom
BCD	Bolt circle diameter
BM	Bench mark
BV	Butterfly valve
BW	Both ways
C/C	Centre to centre
Ch.	Chainage
CHS	Circular hollow section
CI	Cast iron
CJ	Construction joint
CL	Cement lined
CM	Corrugated metal
CMP	Corrugated metal pipe
Conc.	Concrete
crs	Centres
CSP	Corrugated steel pipe
d/s	Down stream
DI	Ductile iron
DN	Nominal diameter
DT	Double textured/textured both sides
EF	Each face
Elev.	Elevation
EW	Each way
FD	Foundation drain
FF	Far face
FL	Finished level
FML	Flexible membrane liner
FWAR	Fillet weld all round
GCL	Geosynthetic clay liner
GL	Ground level
GMS	Galvanised mild steel
GT	Geotextile
HD	High strength
HDPE	High density polyethylene
HT	High tension
HW	Head wall
ID	Inside diameter
IF	Inside face
IL	Invert level
km	Kilometre
kN	Kilonewton
LHS	Left hand side
m	Metre
Max.	Maximum
MDPE	Medium density polyethylene
Min.	Minimum
mm	Millimetre
MPa	Megapascals
MS	Mild steel
ND	Nominal diameter
NF	Near face
No.	Number
NTWL	Normal top water level
OD	Outside diameter
P	Standpipe piezometer
PC	Pneumatic piezometer
PE	Polyethylene
PFC	Parallel flange channel
PSC	Prestressed concrete
R	Mild steel deformed bars
r	Radius
RC	Reinforced concrete
RCP	Reinforced concrete pipe
RCRRJ	Reinforced concrete rubber ring joint
RHS	Right hand side
RL	Reduced level
RM	Reference mark
SDR	Side wall diameter ratio
SHS	Square hollow section
SS	Stainless steel
Stn.	Station
T	Top
TBM	Temporary bench mark
Thk.	Thick
Typ	Typical
u/s	Up stream
Y	High yield steel deformed bars

TERMINOLOGY



DRAWING HATCH PATTERNS

- General refuse
- Topsoil
- In-situ Greywacke
- Existing Ground (non-specific)
- Sprayed Concrete
- No Fines Concrete
- Type 1A compacted soil liner
- Type 1B compacted soil liner
- Type 1 Engineering Fill
- Type 2 Rockfill
- Drainage (20/10)
- Drainage (40/20)

LINE TYPES

- Reinforcement Geogrid
- Protection Geotextile
- HDPE
- GCL

REVISION	DESCRIPTION	BY	DATE
A	Tender issue		

DESIGNED : SJS May.06
DRAWN : FFAN May.06
DESIGN CHECKED :
DRAFTING CHECKED :
CADFILE : P:\8309 1\..\8309 1.400-GEN002
APPROVED :
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HUTT CITY
SILVERSTREAM LANDFILL
SS2 Contract: AD 16 3624

TITLE
PHASE 1 BASE, SLOPES 1 & 2
Abbreviations & Terminology

SCALES (AT A1 SIZE) AS SHOWN
DWG. No. 8309 1.400-GEN002
REV. A

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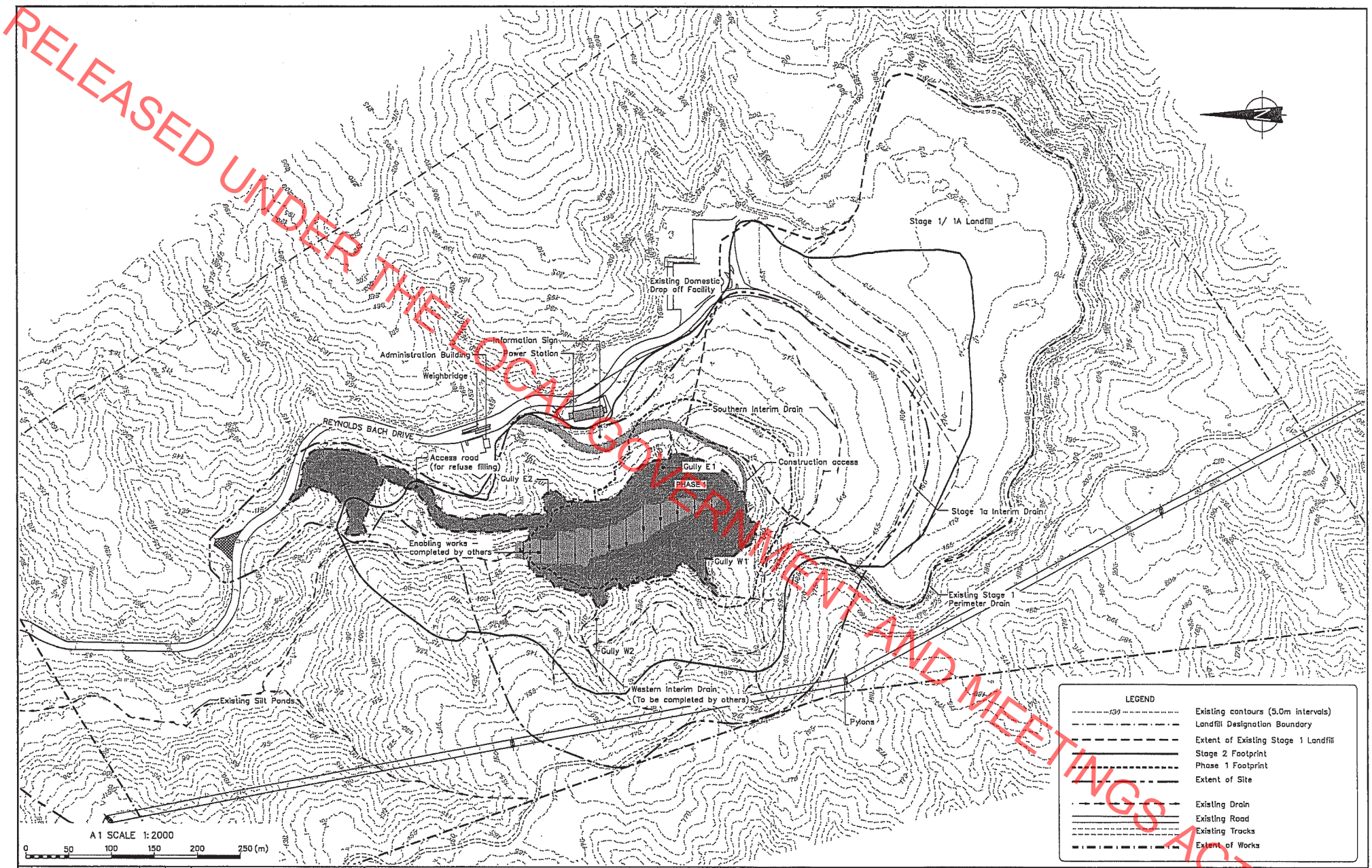

DESIGNED :	SJS	Jun.06	
DRAWN :	FFAN	Jun.06	
DESIGN CHECKED :			
DRAFTING CHECKED :			
CADFILE : P:\8309 1\...\8309 1.400-GEN003			
APPROVED : NOT FOR CONSTRUCTION			

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REVISION	DESCRIPTION	BY	DATE
A	Tender Issue		

NOTES :
1. All dimensions are in millimetres unless noted otherwise.
2. Coordinates:
Coordinate Datum: NZ Geodetic 1949 Wellington Circuit Coordinates
Origin: Mt Cook 700,000 mN 300,000 mE
Level Datum: LINZ (MSL).
3. Existing ground contours created from Airborne Laser Scanning data flown 2 August 2005. Data provided by AAMHATCH Pty Ltd, Reference: 2 10 11 190 1nob.

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HUTT CITY

SILVERSTREAM LANDFILL
SS2 Contract: AD 16 3624

TITLE
PHASE 1 BASE, SLOPES 1 & 2
Project Plan

SCALES (AT A1 SIZE)	DWG. No.	REV.
1: 2000	8309 1.400--GEN003	A

P:\83091\83091.402\WorkingMaterial\CAD\Design Dwgs\83091.400-GEN003.dwg, 003, 19/07/2006 5:47:05 p., sjs, 1:2

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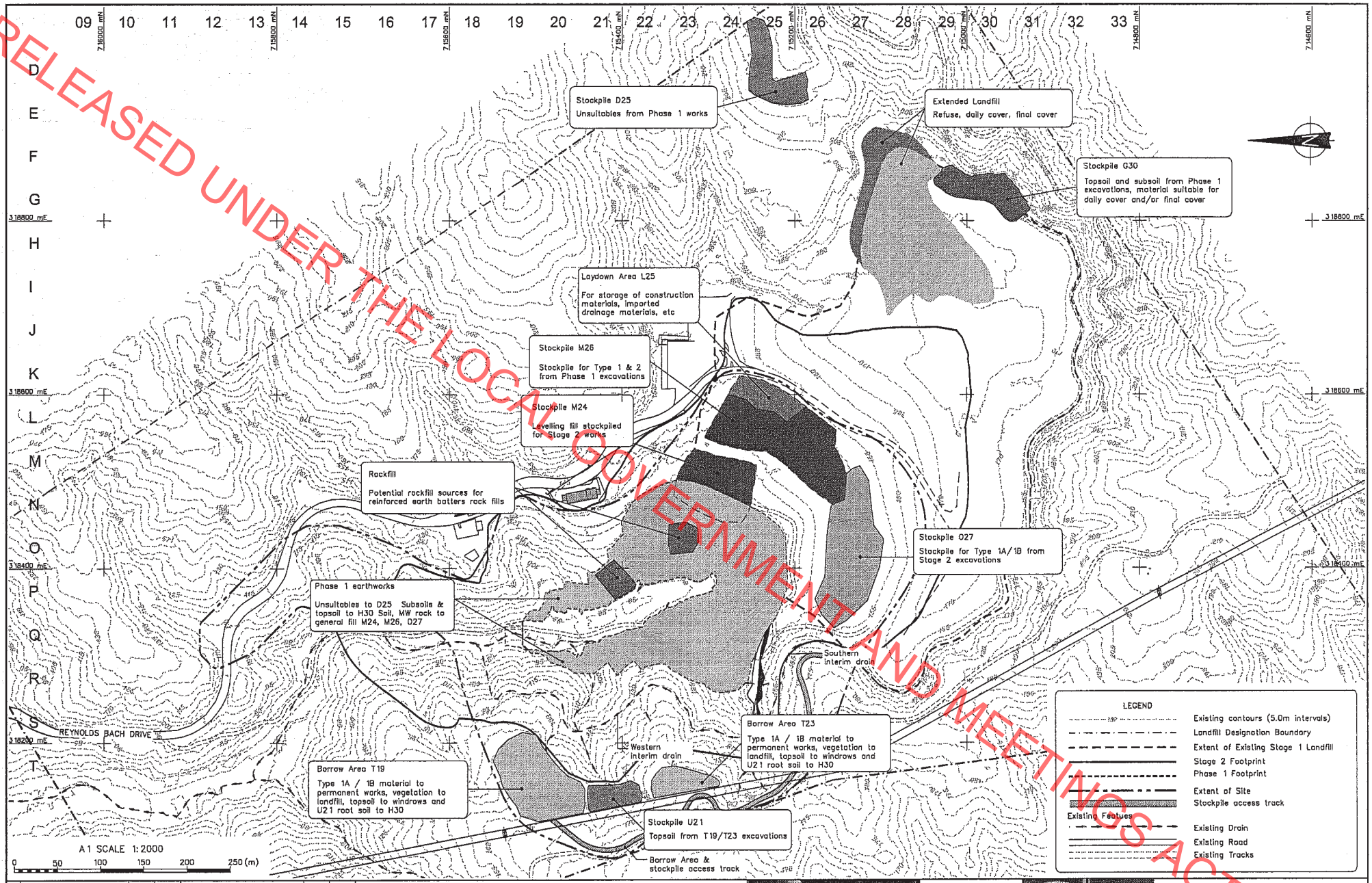

REVISION DESCRIPTION	BY	DATE
A Tender Issue		

DESIGNED :	SJS	Jun.06
DRAWN :	FFAN	Jun.06
DESIGN CHECKED :		
DRAFTING CHECKED :		
CADFILE : P:\8309 1\..\8309 1.400-GEN004		
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Origin: Mt Cook 700,000 mN 300,000 mE
Level Datum: LINZ (MSL).
3. Existing ground contours created from Airborne Laser Scanning data flown 2 August 2005. Data provided by AAMHATCH Pty Ltd, Reference: 2 10 1 1 190 1nob.

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HUTT CITY

SILVERSTREAM LANDFILL
SS2 Contract: AD 16 3624

TITLE
PHASE 1 BASE, SLOPES 1 & 2
Stockpile and Borrow Area Location Plan

SCALES (AT A1 SIZE)	DWG. No.	REV.
1: 2000	8309 1.400-GEN004	A

P:\83091\83091.402\WorkingMaterial\CAD\Design Dwgs\83091.400-GEN004.dwg, 004, 19/07/2006 5:47:21 p., SJS, 1:2

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				DRAWN :	FFAN May.06
				DESIGN CHECKED :	
				DRAFTING CHECKED :	
				CADFILE : P:\8309 1\..\8309 1.400–FOR 101	
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2. Coordinates:
   Coordinate Datum: NZ Geodetic 1949 Wellington Circuit Coordinates
   Origin: Mt Cook 700,000 mN 300,000 mE
   Level Datum: LINZ (MSL).
3. Existing ground contours created from Airborne Laser Scanning data flown 2 August 2005. Data provided by AAMHATCH Pty Ltd, Reference: 2 10 1 1 190 1nob.
4. Enabling works contours to be confirmed prior to commencement of the works

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SILVERSTREAM LANDFILL
SS2 Contract: AD 16 3264

TITLE
PHASE 1 BASE, SLOPES 1 & 2
Existing Contours

SCALES (AT A1 SIZE) 1:500
DWG. No. 8309 1.400–FOR 101
REV. A

P:\83091\83091.402\WorkingMaterial\CAD\Design Dwgs\83091.400-FOR101.dwg, 101, 19/07/2006 5:47:42 p., sjs, 1:2

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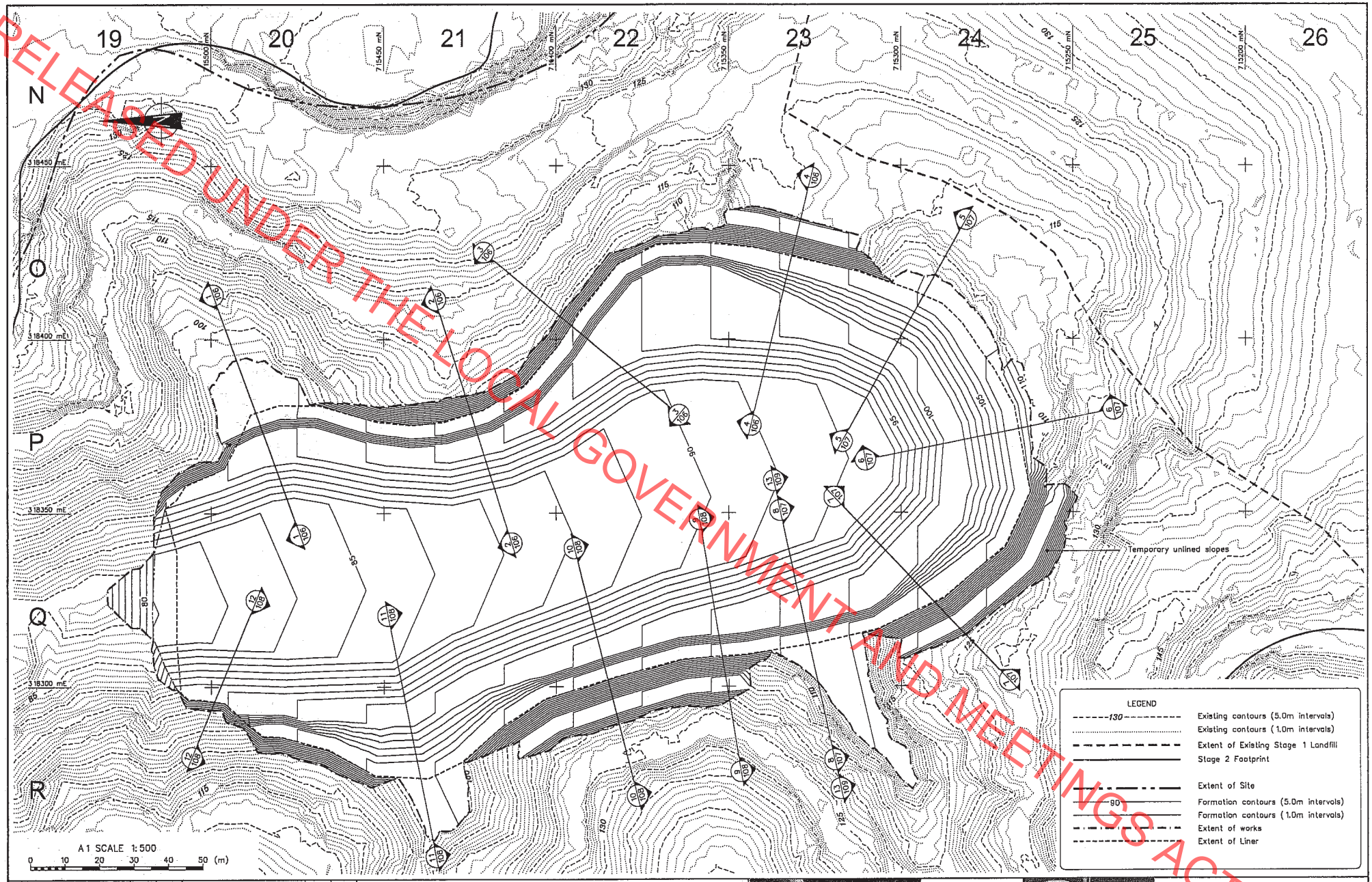

DESIGNED :	SJS	June.06
DRAWN :	RDB	June.06
DESIGN CHECKED :		
DRAFTING CHECKED :		
CADFILE : P:\8309 1\..\8309 1.400–FOR 102		
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A	Tender Issue		

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2. Coordinates:
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   Origin: Mt Cook 700,000 mN 300,000 mE
   Level Datum: LINZ (MSL).
3. Existing ground contours created from Airborne Laser Scanning data flown 2 August 2005. Data provided by AAMHATCH Pty Ltd, Reference: 2 10 1 1 190 1nab.

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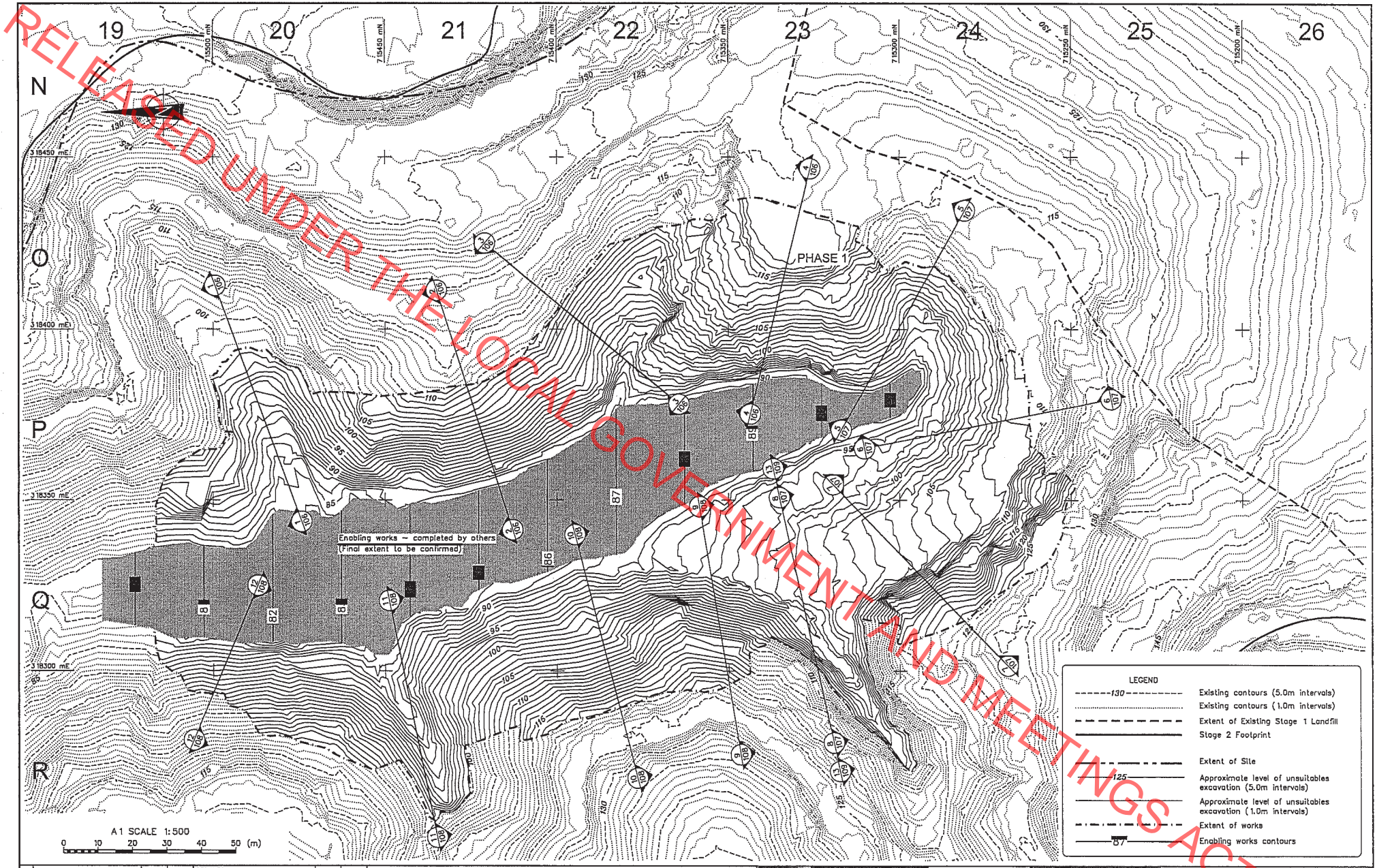
SILVERSTREAM LANDFILL
SS2 Contract: AD 16 3624

TITLE
PHASE 1 BASE, SLOPES 1 & 2
HDPE Geomembrane Liner Level

SCALES (AT A1 SIZE)	DWG. No.	REV.
1:500	8309 1.400–FOR 102	A

P:\83091\83091.402\WorkingMaterial\CAD\Design Dwgs\83091.400-FOR102.dwg, 102, 19/07/2006 5:48:00 p., sjs, 1:2



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			DESIGNED :	SJS	Sep.05
			DRAWN :	RDB	Sep.05
			DESIGN CHECKED :		
			DRAFTING CHECKED :		
			CADFILE : P:\8309 1\..\8309 1.400-FOR 103		
			APPROVED :		
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   Origin: Mt Cook 700,000 mN 300,000 mE
   Level Datum: LINZ (MSL).
3. Existing ground contours created from Airborne Laser Scanning data flown 2 August 2005. Data provided by AAMHATCH Pty Ltd, Reference: 2 1011190 1nob.

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HUTT CITY

SILVERSTREAM LANDFILL
SS2 Contract: AD 16 3624

TITLE
PHASE 1 BASE, SLOPES 1 & 2
Base of Unsuitables

SCALES (AT A1 SIZE)	DWG. No.	REV.
1:500	8309 1.400-FOR 103	A

P:\83091\83091.402\WorkingMaterial\CAD\Design Dwgs\83091.400-FOR103.dwg, 103, 19/07/2006 5:48:20 p., sjs, 1:2

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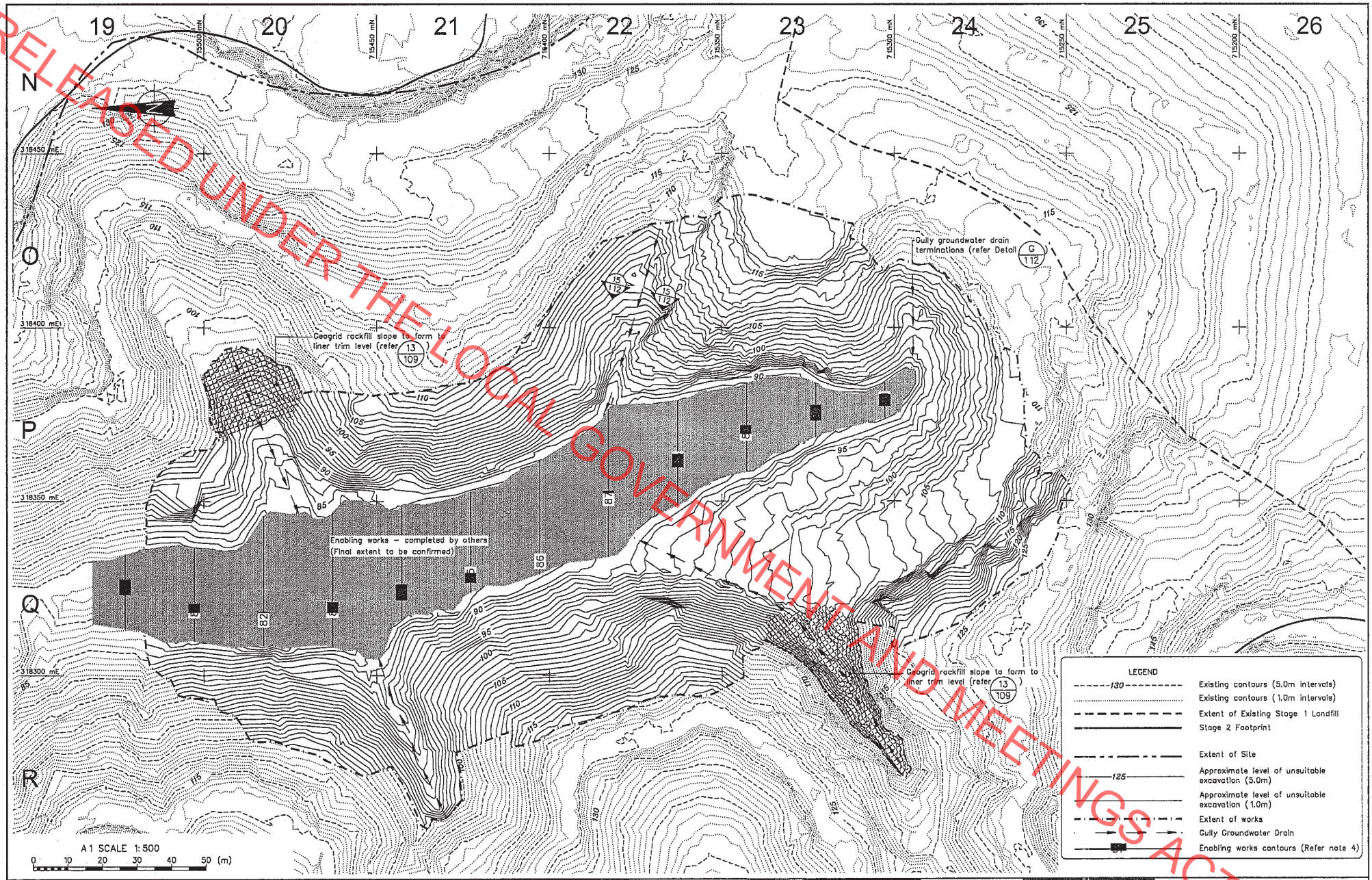

DESIGNED :	SJS	May.06
DRAWN :	FFAN	May.06
DESIGN CHECKED :		
DRAFTING CHECKED :		
CADFILE : P:\8309 1\..\8309 1.400–FOR 104		
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A	Tender Issue		

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2. Coordinates:
   Coordinate Datum: NZ Geodetic 1949 Wellington Circuit Coordinates
   Origin: Mt Cook 700,000 mN 300,000 mE
   Level Datum: LINZ (MSL).
3. Existing ground contours created from Airborne Laser Scanning data flown 2 August 2005. Data provided by AAMHATCH Pty Ltd, Reference: 2 10 1 1 190 1nob.
4. Enabling works contours to be confirmed prior to commencement of the works

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HUTT CITY

SILVERSTREAM LANDFILL
SS2 Contract: AD 16 3624

TITLE
PHASE 1 BASE, SLOPES 1 & 2
Groundwater Drainage Plan (Sheet 1 of 2)

SCALES (AT A1 SIZE)	DWG. No.	REV.
1:500	8309 1.400–FOR 104	A

P:\83091\83091.402\WorkingMaterial\CAD\Design Dwgs\83091.400-FOR104.dwg, 104, 19/07/2006 5:48:39 p., sjs, 1:2

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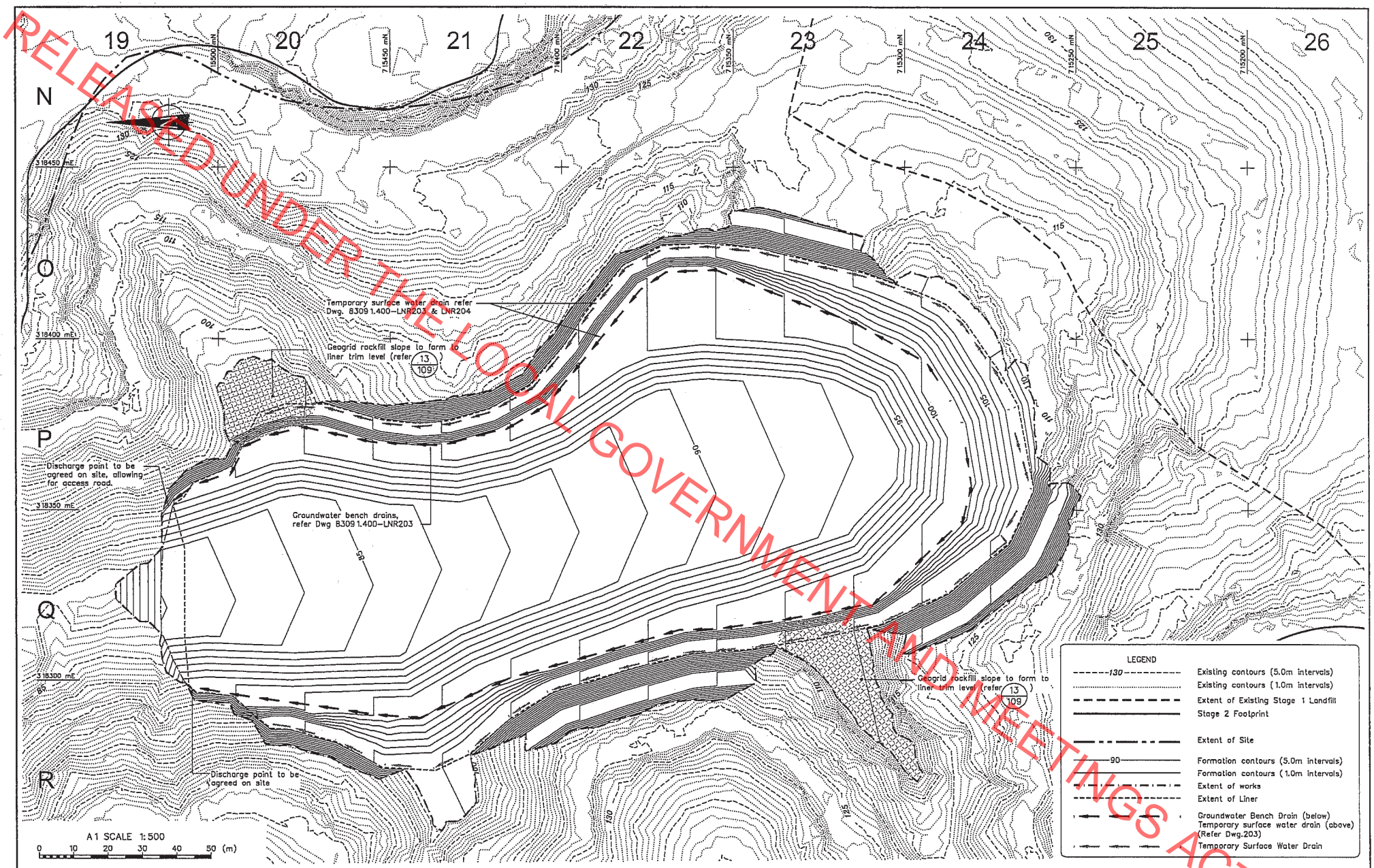

DESIGNED :	SJS	June.05
DRAWN :	RDB	June.06
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DRAFTING CHECKED :		
CADFILE : P:\8309 1\..\8309 1.400–FOR 105		
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A Tender Issue		

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2. Coordinates:
   Coordinate Datum: NZ Geodetic 1949 Wellington Circuit Coordinates
   Origin: Mt Cook 700,000 mN 300,000 mE
   Level Datum: LINZ (MSL).
3. Existing ground contours created from Airborne Laser Scanning data flown 2 August 2005. Data provided by AAMHATCH Pty Ltd, Reference: 2 10 11 190 1nob.

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SILVERSTREAM LANDFILL
SS2 Contract: AD 16 3624

TITLE
PHASE 1 BASE, SLOPES 1 & 2
Groundwater Drainage Plan (Sheet 2 of 2)

SCALES (AT A1 SIZE)	DWG. No.	REV.
1:500	8309 1.400–FOR 105	A

P:\83091\83091.402\WorkingMaterial\CAD\Design Dwgs\83091.400-FOR105.dwg, 105, 19/07/2006 5:48:59 p., sjs, 1:2

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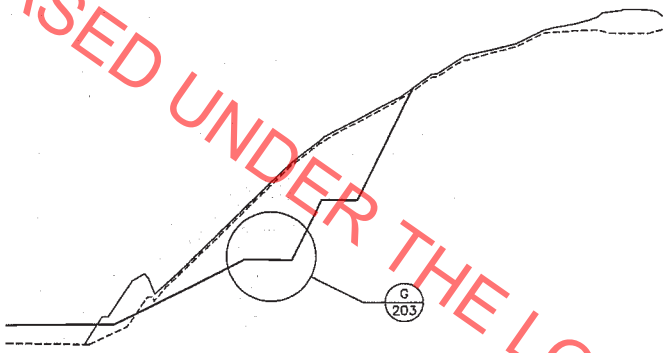
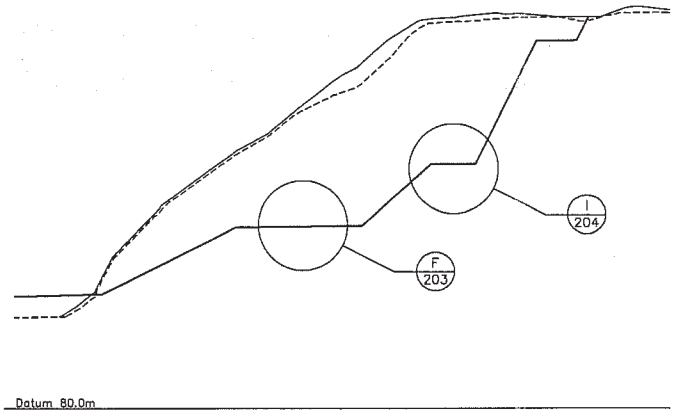
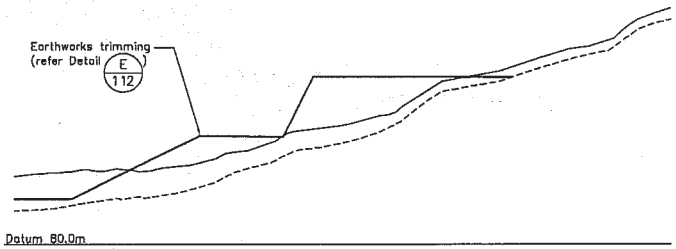


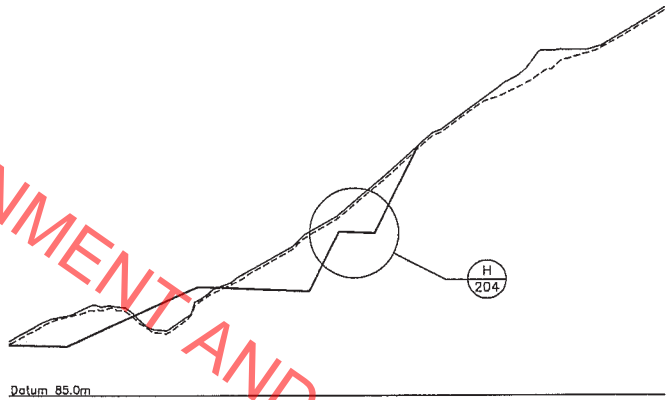
SECTION 2/102 2/103
SCALE 1:250



SECTION 4/102 4/103
SCALE 1:250



SECTION 1/102 1/103
SCALE 1:250



SECTION 3/102 3/103
SCALE 1:250

LEGEND
- Existing Ground Level (Refer Note 2)
- Approx level of unsuitables
- Formation Level
- Approx level of enabling works (To be confirmed)

A1 SCALE 1:250
0 5 10 15 20 25 (m)

REVISION	DESCRIPTION	BY	DATE
A	Tender Issue		

DESIGNED : SJS June.06
DRAWN : ROB June.06
DESIGN CHECKED :
DRAFTING CHECKED :
CADFILE : P:\83..\8309 1.400-FOR 106_108
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2. Existing ground level based on Airborne Laser Scanning data flown 2 August 2005. Data provided by AAMHATCH Pty Ltd, Reference: 210111900ab. (Levels have been modified during 2005/2006 construction season).

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HUTT CITY
SILVERSTREAM LANDFILL
SS2 Contract: AD 16 3624

TITLE
PHASE 1 BASE, SLOPES 1 & 2
Cross Sections (Sheet 1 of 3)

SCALES (AT A1 SIZE) 1:250
DWG. No. 8309 1.400-FOR 106
REV. A

P:\83091\83091.402\WorkingMaterial\CAD\Design Dwgs\83091.400-FOR106_108.dwg, 106, 19/07/2006 5:49:29 p., sjs, 1:2

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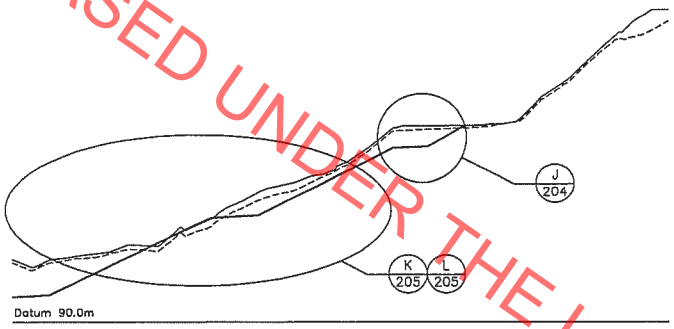
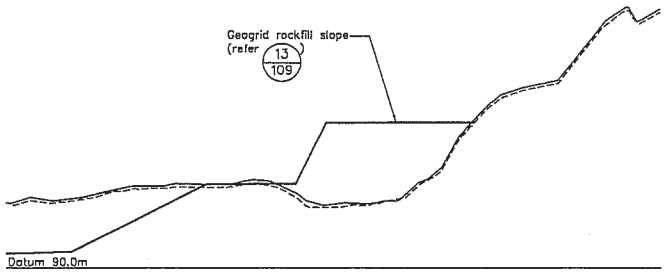
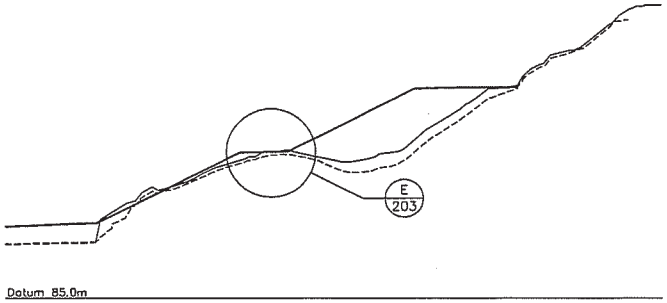


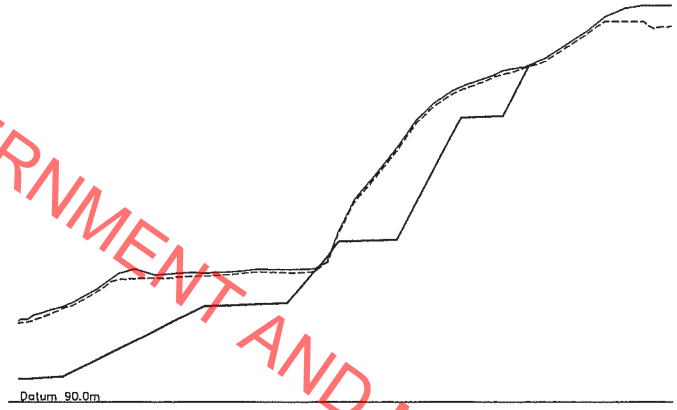
SECTION 6/102 6/103
SCALE 1:250



SECTION 8/102 8/103
SCALE 1:250



SECTION 5/102 6/103
SCALE 1:250



SECTION 7/102 7/103
SCALE 1:250

LEGEND
- Existing Ground Level (Refer Note 2)
- Approx level of unsuitables
- Formation Level
- Approx level of enabling works (To be confirmed)

A1 SCALE 1:250
0 5 10 15 20 25 (m)

REVISION DESCRIPTION	BY	DATE
A Tender Issue		

DESIGNED : SJS June.06
DRAWN : RDB June.06
DESIGN CHECKED :
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CADFILE : P:\83..\8309 1.400-FOR 106_108
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SS2 Contract: AD 16 3624

TITLE
PHASE 1 BASE, SLOPES 1 & 2
Cross Sections (Sheet 2 of 3)

SCALES (AT A1 SIZE) 1: 250
DWG. No. 8309 1.400-FOR 107
REV. A

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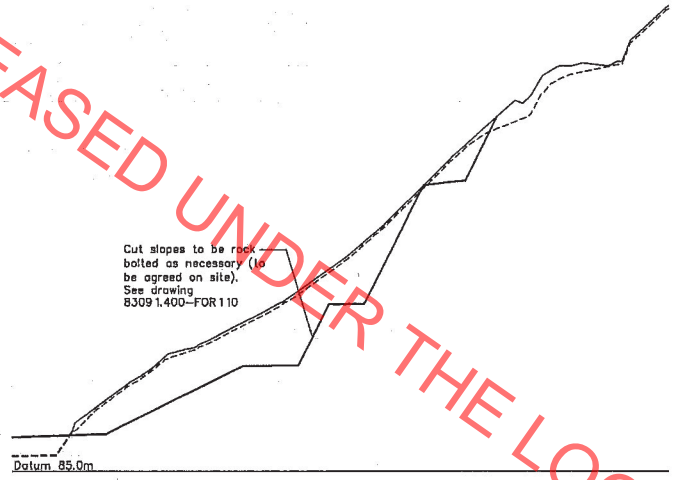
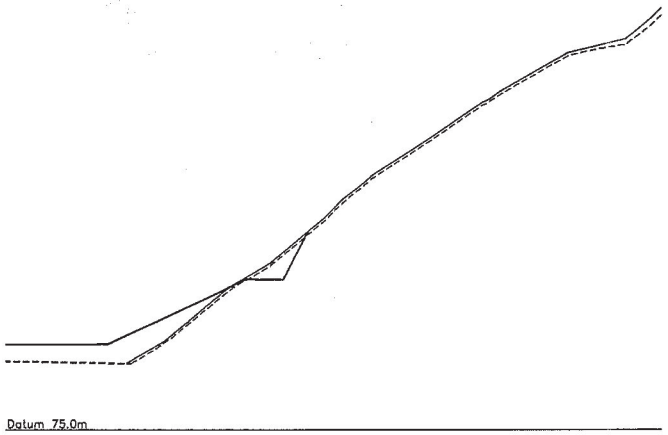
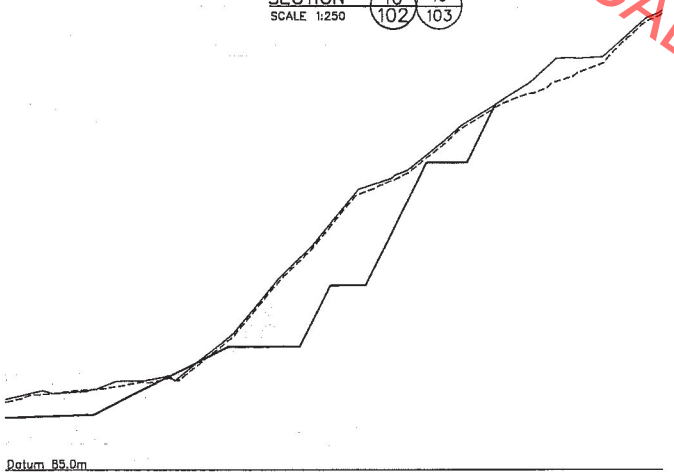


SECTION 10/102 10/103
SCALE 1:250



SECTION 12/102 12/103
SCALE 1:250



SECTION 9/102 9/103
SCALE 1:250

SECTION 11/102 11/103
SCALE 1:250

LEGEND
- Existing Ground Level (Refer Note 2)
- Approx level of unsuitables
- Formation Level
- Approx level of enabling works (To be confirmed)

A1 SCALE 1:250
0 5 10 15 20 25 (m)

REVISION	DESCRIPTION	BY	DATE
A	Tender Issue		

DESIGNED : SJS June.06
DRAWN : RDB June.06
DESIGN CHECKED :
DRAFTING CHECKED :
CADFILE : P:\83..\8309 1.400–FOR 106_108
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HUTT CITY
SILVERSTREAM LANDFILL
SS2 Contract: AD 16 3624

TITLE
PHASE 1 BASE, SLOPES 1 & 2
Cross Sections (Sheet 3 of 3)

SCALES (AT A1 SIZE) 1:250
DWG. No. 8309 1.400–FOR 108
REV. A

P:\83091\83091.402\WorkingMaterial\CAD\Design Dwgs\83091.400-FOR106_108.dwg, 108, 19/07/2006 5:49:31 p., sjs, 1:2

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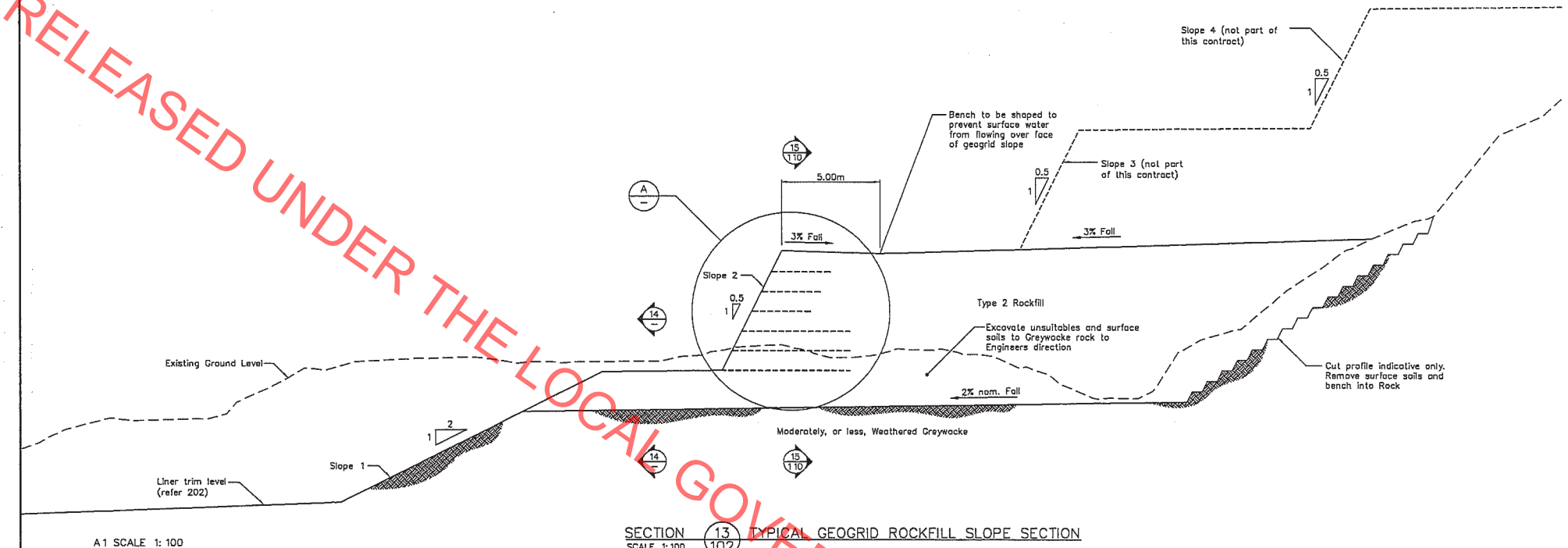
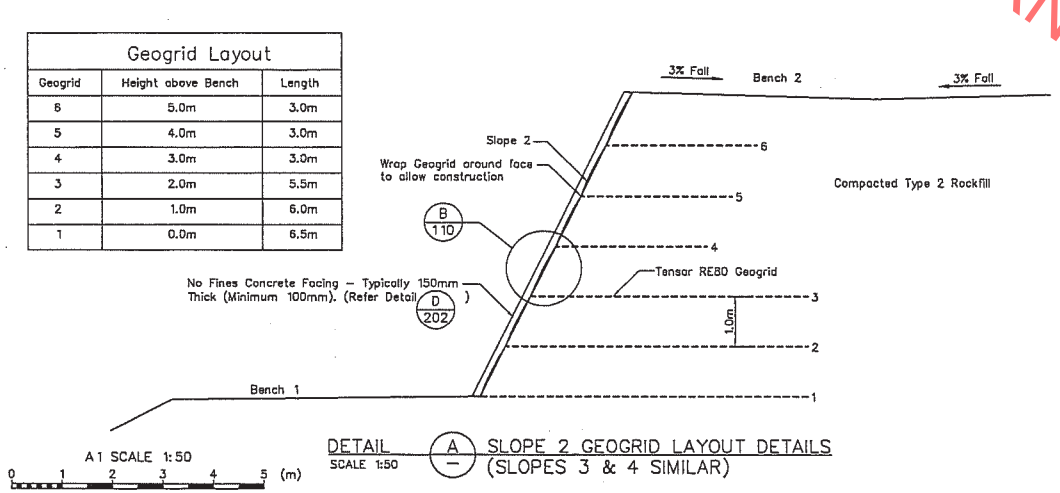
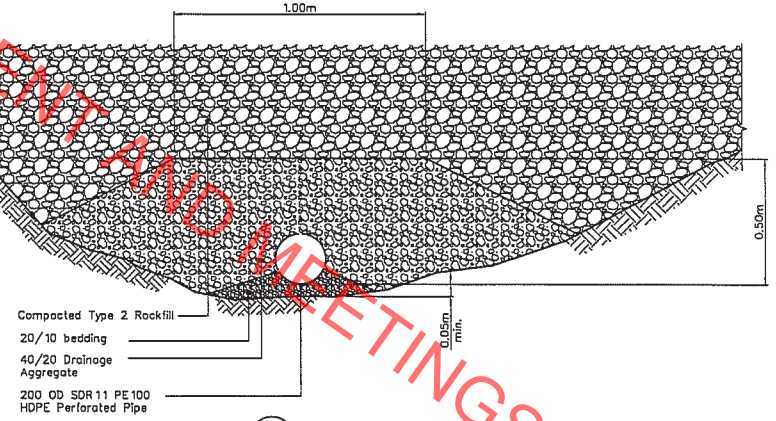


SECTION 13/102 SCALE 1:100 TYPICAL GEOGRID ROCKFILL SLOPE SECTION

Geogrid Layout		
Geogrid	Height above Bench	Length
6	5.0m	3.0m
5	4.0m	3.0m
4	3.0m	3.0m
3	2.0m	5.5m
2	1.0m	6.0m
1	0.0m	6.5m



DETAIL A SCALE 1:50 SLOPE 2 GEOGRID LAYOUT DETAILS (SLOPES 3 & 4 SIMILAR)



SECTION 14 SCALE 1:10 GULLY GROUNDWATER DRAIN BENEATH GEOGRID ROCKFILL

REVISION	DESCRIPTION	BY	DATE
A	Tender Issue		

DESIGNED : RGC Jun.06
DRAWN : NRM Jun.06
DESIGN CHECKED :
DRAFTING CHECKED :
CADFILE : P:\83..\8309 1.400–FOR 109_111
APPROVED :
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NOTES :
1. All dimensions are in millimetres unless noted otherwise.
2. Rockfill within 300mm of geogrid reinforcement shall have maximum particle size of 100mm.

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HUTT CITY
SILVERSTREAM LANDFILL
SS2 Contract: AD 16 3624
TITLE
PHASE 1 BASE, SLOPES 1 & 2
Geogrid Rockfill Slope (Sheet 1 of 2)
SCALES (AT A1 SIZE) AS SHOWN
DWG. No. 8309 1.400–FOR 109
REV. A

P:\8309\1\8309.1.402\WorkingMaterial\CAD\Design Dwgs\83091.400-FOR109_111.dwg, 109, 19/07/2006 5:49:39 p., sjs, 1:2

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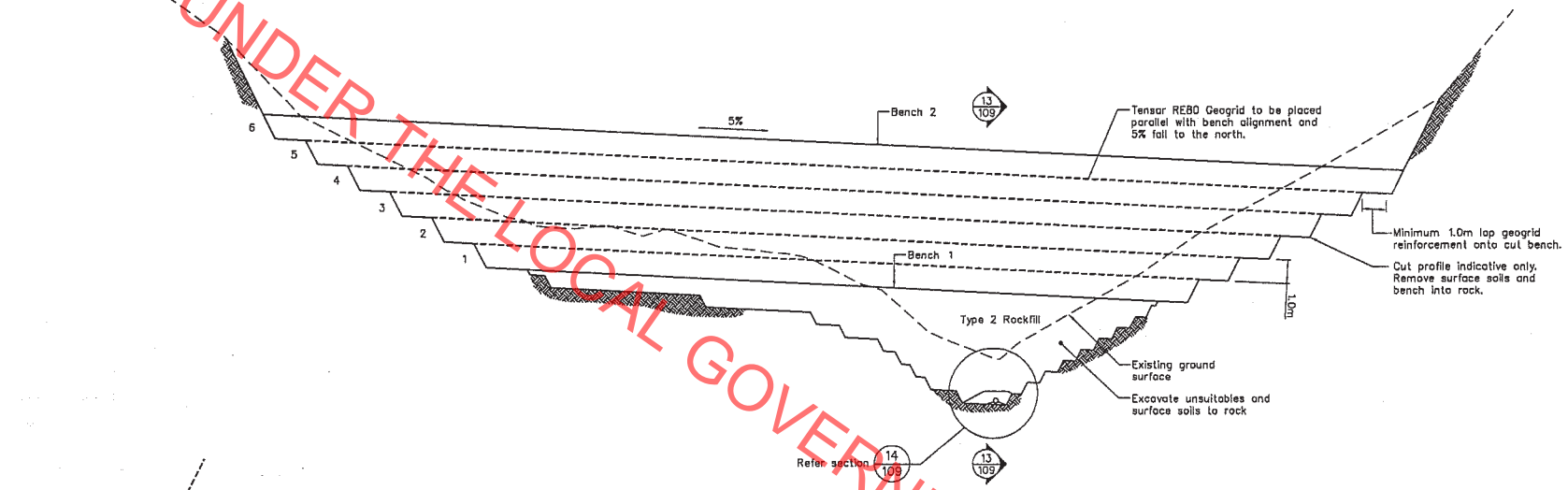
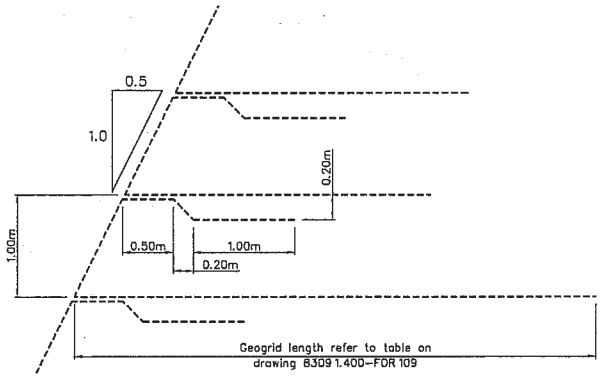


SECTION 15/109 TYPICAL ROCK BUTTRESS
SCALE 1:100

A1 SCALE 1:100
0 1 2 3 4 6 8 10 (m)



DETAIL B/109 WRAP AROUND FACE TEMPLATE
SCALE 1:25

A1 SCALE 1:25
0 0.5 1.0 1.5 2.0 2.5 (m)

REVISION DESCRIPTION	BY	DATE
A Tender Issue		

DESIGNED :	RGC	Jul.06
DRAWN :	MBG	Jul.06
DESIGN CHECKED :		
DRAFTING CHECKED :		
CADFILE : P:\83..\8309 1.400-FOR 109_111		
APPROVED : NOT FOR CONSTRUCTION		

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NOTES :
1. All dimensions are in metres unless noted otherwise.
2. Rockfill within 300mm geogrid reinforcement shall have maximum particle size of 100mm.

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Tel. (09) 355 8000 Fax. (09) 307 0265
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HUTT CITY
SILVERSTREAM LANDFILL
SS2 Contract: AD 16 3624

TITLE
PHASE 1 BASE, SLOPES 1 & 2
Geogrid Rockfill Slope (Sheet 2 of 2)

SCALES (AT A1 SIZE)	DWG. No.	REV.
AS SHOWN	8309 1.400-FOR 110	A

P:\83091\83091.402\WorkingMaterial\CAD\Design Dwgs\83091.400-FOR109_111.dwg, 110, 19/07/2006 5:49:40 p., sjs, 1:2

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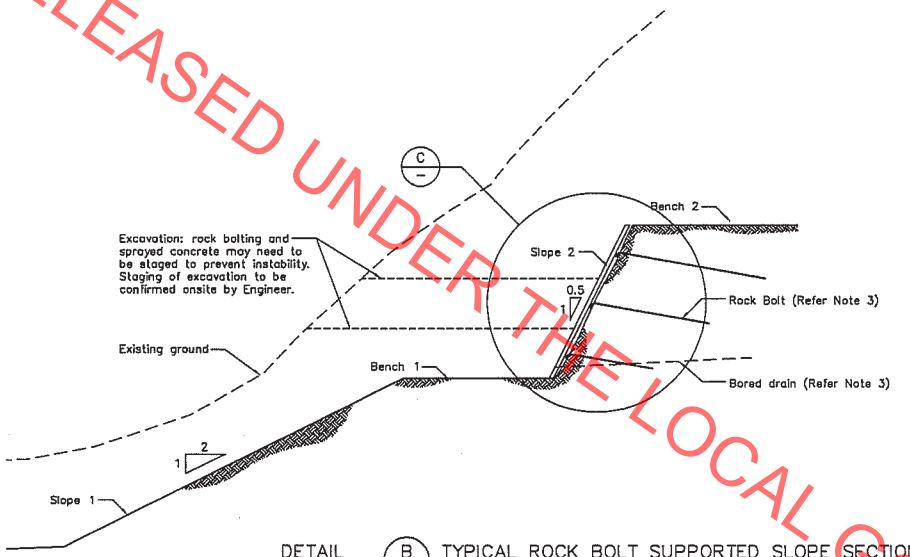
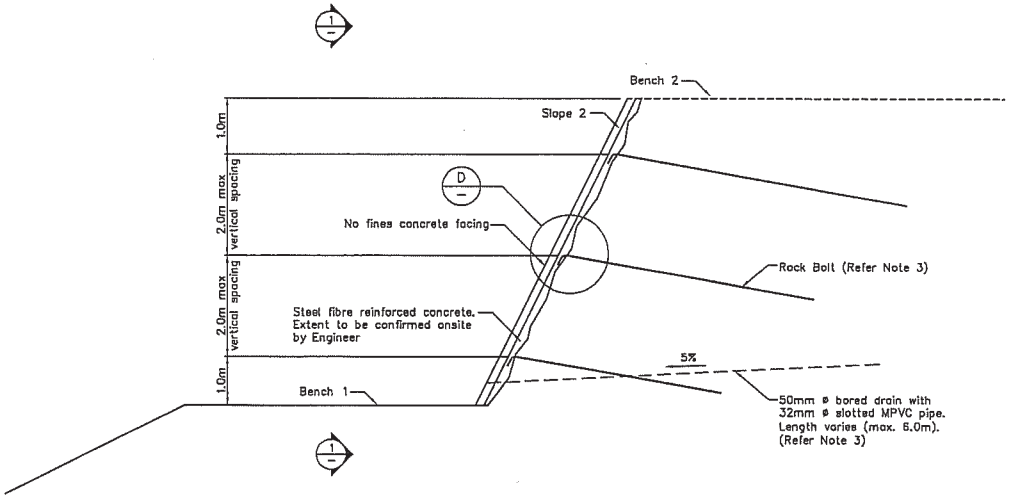
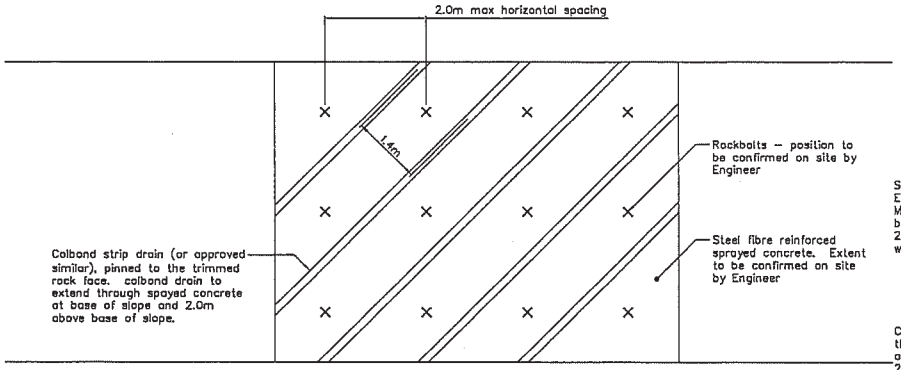


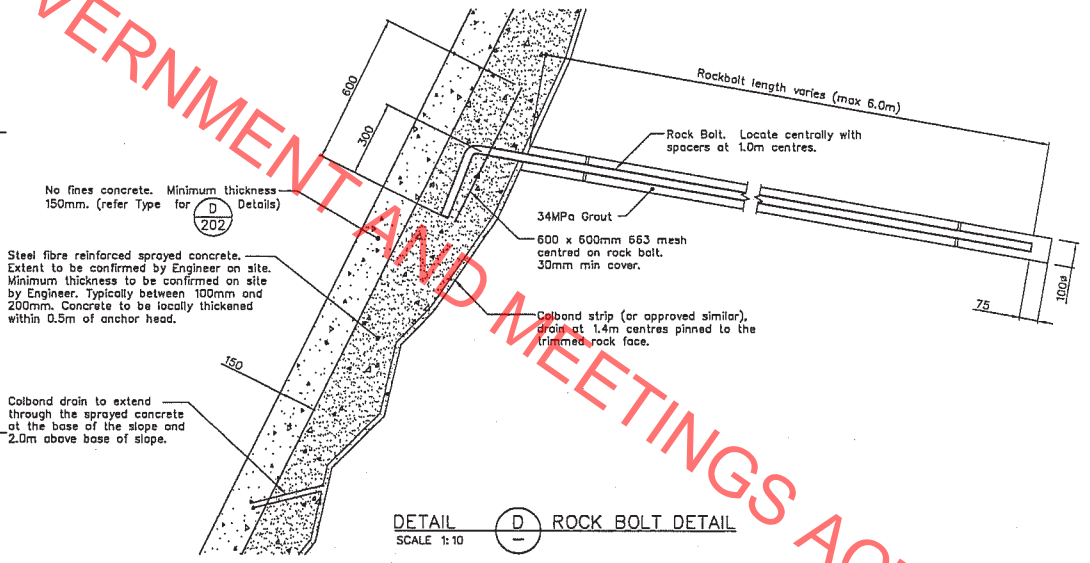
DETAIL B 107 TYPICAL ROCK BOLT SUPPORTED SLOPE SECTION
SCALE 1:100



DETAIL C TYPICAL ROCK BOLT SUPPORTED SLOPE DETAIL
SCALE 1:50



ELEVATION 1 TYPICAL ROCK BOLT SUPPORTED SLOPE ELEVATION
SCALE 1:50



DETAIL D ROCK BOLT DETAIL
SCALE 1:10

A1 SCALE 1:50
0 1 2 3 4 5 (m)

REVISION	DESCRIPTION	BY	DATE
A	Tender Issue		

DESIGNED :	RGC	Jun.06
DRAWN :	NRM	Jun.06
DESIGN CHECKED :		
DRAFTING CHECKED :		

CADFILE : P:\83..\8309 1.400–FOR 109_111

APPROVED :
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NOTES :
1. All dimensions are in millimetres unless noted otherwise.
2. Extent and thickness of steel fibre reinforced concrete to be confirmed by Engineer on site. Thickness typically between 100mm & 200mm.
3. Position, size and length of rock bolts and bored drains to be confirmed by Engineer on site. Maximum length of rock bolts and bored drains is 6.0m. This drawing shows typical layout of rock bolts and bored drain.

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HUTT CITY

SILVERSTREAM LANDFILL
SS2 Contract: AD 16 3624

TITLE
PHASE 1 BASE, SLOPES 1 & 2
Rock Bolt and Sprayed Concrete Supported Slope

SCALES (AT A1 SIZE) AS SHOWN
DWG. No. 8309 1.400–FOR 111
REV. A

P:\83091\83091.402\WorkingMaterial\CAD\Design Dwgs\83091.400-FOR109_111.dwg, 111, 19/07/2006 5:49:41 p., sjs, 1:2

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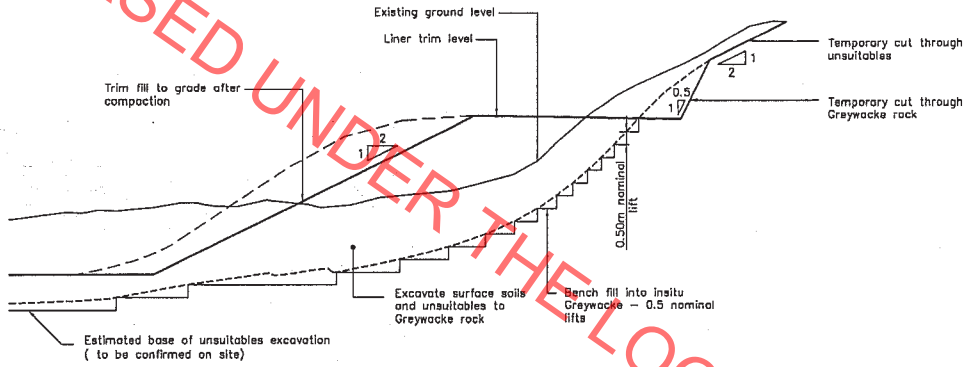
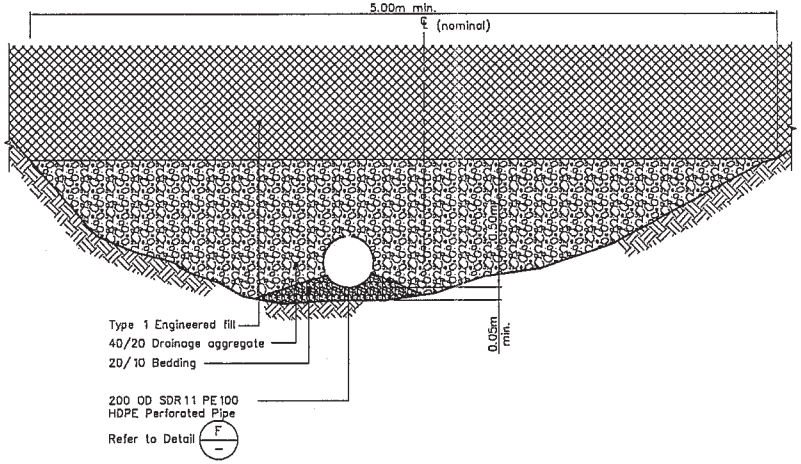
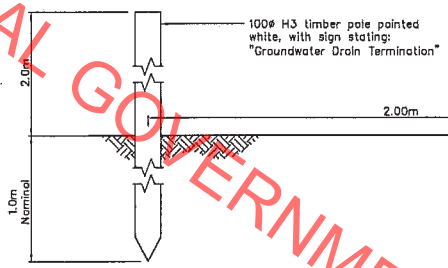
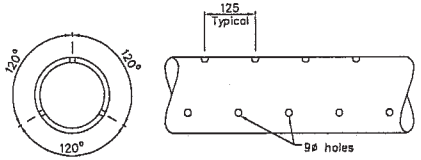


DETAIL E/106 TYPICAL EARTHWORKS TRIMMING
SCALE 1:100

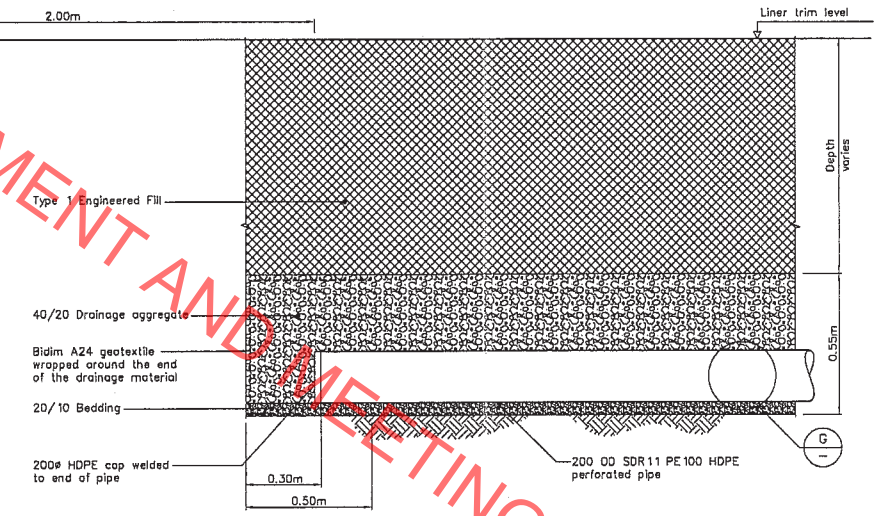


SECTION 15/104 GULLY GROUNDWATER DRAIN
SCALE 1:10





DETAIL F/– PERFORATION DETAIL
SCALE N.T.S



DETAIL G/104 GULLY GROUNDWATER DRAIN TERMINATIONS
SCALE 1:10

A1 SCALE 1:10
0 0.2 0.4 0.6 0.8 1.0 (m)

REVISION DESCRIPTION	BY	DATE
A Tender Issue		

DESIGNED :	SJS	Jun.06
DRAWN :	FFAN	Jun.06
DESIGN CHECKED :		
DRAFTING CHECKED :		
CADFILE : P:\8309 1\..\8309 1.400–FOR 1 12		
APPROVED : NOT FOR CONSTRUCTION		

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HUTT CITY
SILVERSTREAM LANDFILL
SS2 Contract: AD 16 3624

TITLE
PHASE 1 BASE, SLOPES 1 & 2
Groundwater Drainage Details

SCALES (AT A1 SIZE) AS SHOWN
DWG. No. 8309 1.400–FOR 112
REV. A

P:\83091\83091.402\WorkingMaterial\CAD\Design Dwgs\83091.400-FOR112.dwg, 112, 19/07/2006 5:49:46 p., sjs, 1:2

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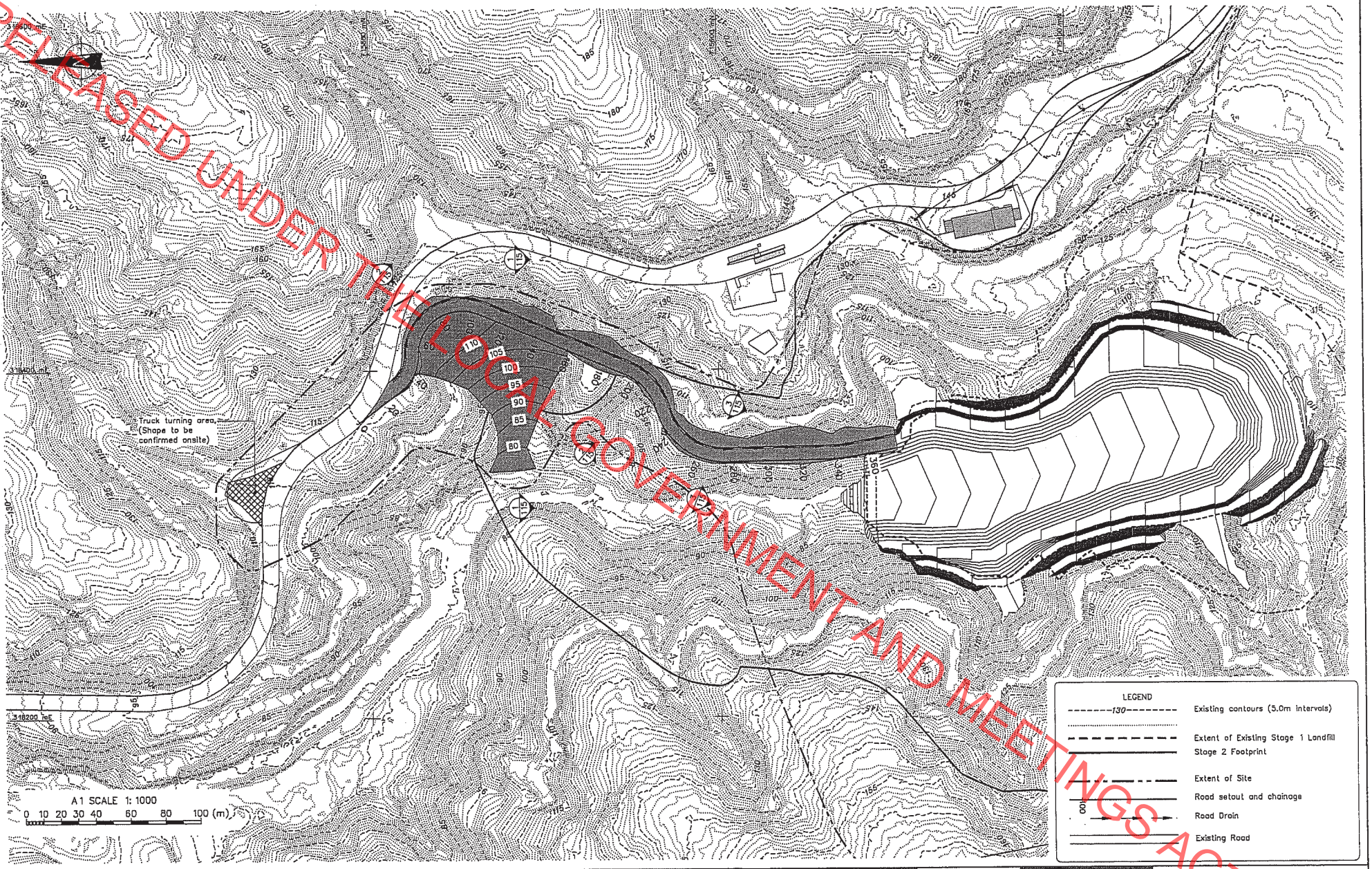

REVISION	DESCRIPTION	BY	DATE
A	Tender Issue		

DESIGNED : BKD June.06
DRAWN : BKD June.06
DESIGN CHECKED :
DRAFTING CHECKED :
CADFILE : P:\8309 1\...\8309 1.400-FOR 113
APPROVED :
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NOTES :
1. All dimensions are in metres unless noted otherwise.
2. Level Datum: LINZ (MSL) Wellington Vertical Datum 1953.
3. Existing ground levels from data provided by Airborne Laser Scanning data flown 2 August 2005. Data provided by AAMHATCH Pty Ltd, Reference: 2 10 1 1 190 1nob.

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HUTT CITY
SILVERSTREAM LANDFILL
SS2 Contract: AD 16 3624

TITLE
PHASE 1 BASE, SLOPES 1 & 2
Access road plan

SCALES (AT A1 SIZE) 1: 1000
DWG. No. 8309 1.400-FOR 113
REV. A

P:\83091\83091.402\WorkingMaterial\CAD\Design Dwgs\83091.400-FOR113.dwg, 113, 19/07/2006 5:49:58 p.m., sjs, 1:2

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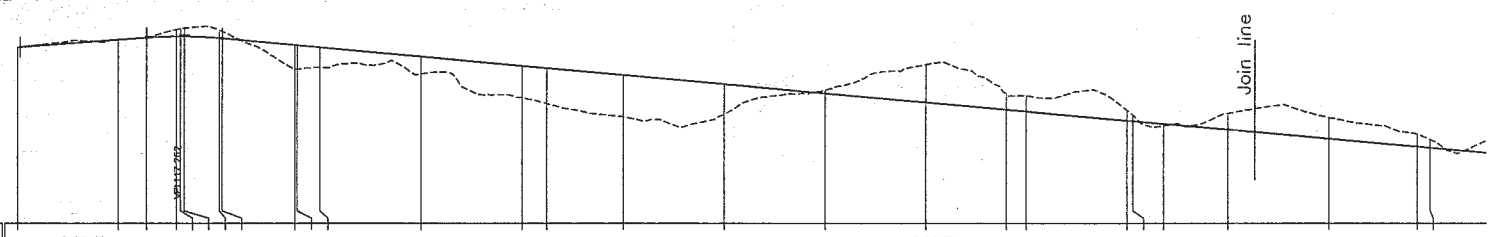

Datum RL80

| | | |

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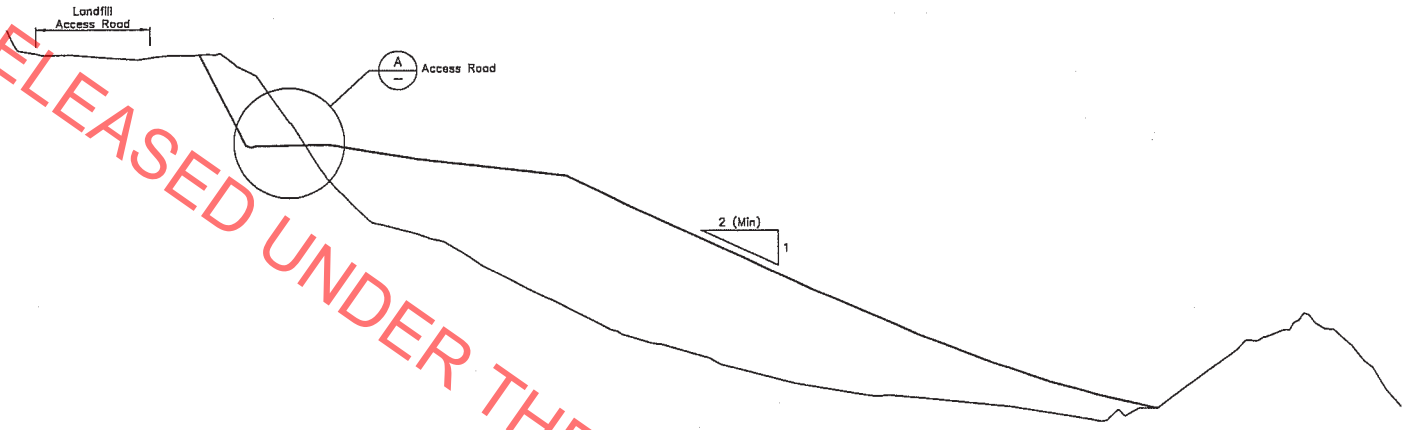
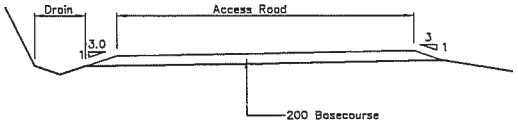
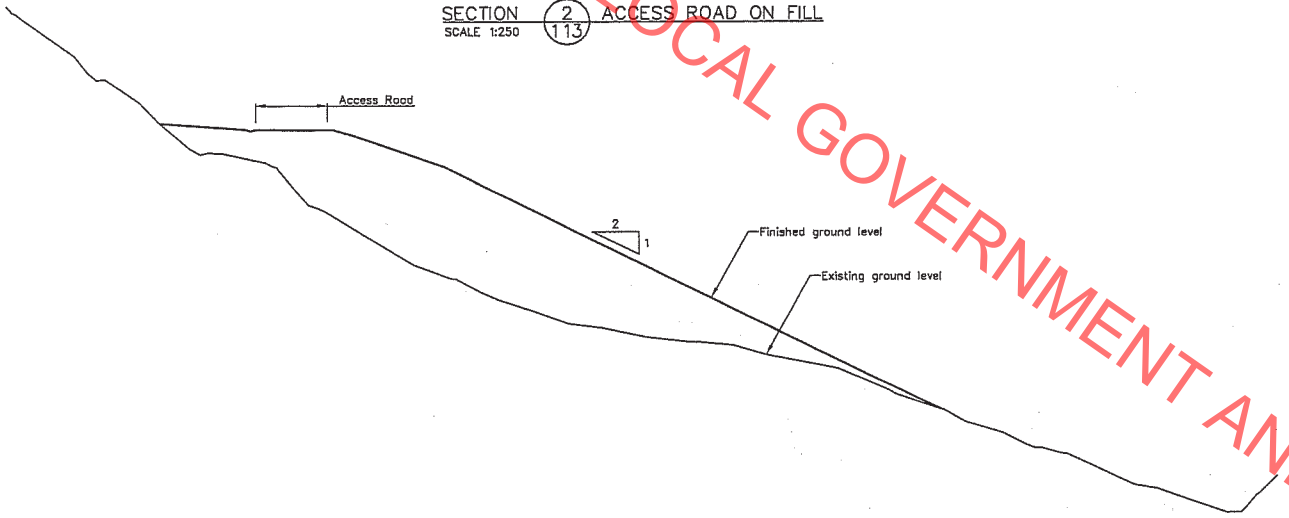


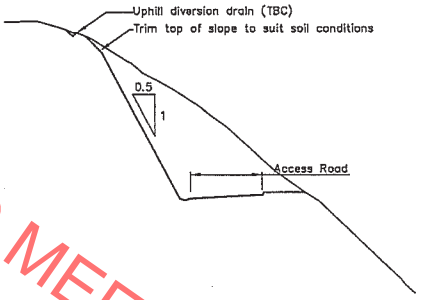
SECTION 2/113 ACCESS ROAD ON FILL
SCALE 1:250



DETAIL A/– ACCESS ROAD
SCALE 1:50



SECTION 1/113 ACCESS ROAD ON FILL
SCALE 1:250



SECTION 2/113 ACCESS ROAD IN CUT
SCALE 1:250

A1 SCALE 1:250
0 5 10 15 20 25 (m)

REVISION DESCRIPTION	BY	DATE
A Tender Issue		

DESIGNED : BKD June.06
DRAWN : BKD June.06
DESIGN CHECKED :
DRAFTING CHECKED :
CADFILE : P:\83091\..\8309 1.400–FOR 115
APPROVED :
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NOTES :
1. All dimensions are in metres unless noted otherwise.
2. Level Datum: LINZ (MSL) Wellington Vertical Datum 1953.
3. Existing ground levels from data provided by Airborne Laser Scanning data flown 2 August 2005. Data provided by AAMHATCH Pty Ltd, Reference: 2 10 1 1 190 1nob.
4. Extent fo unsuitables to be determined on site during construction.

REFERENCE :

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Environmental & Engineering Consultants
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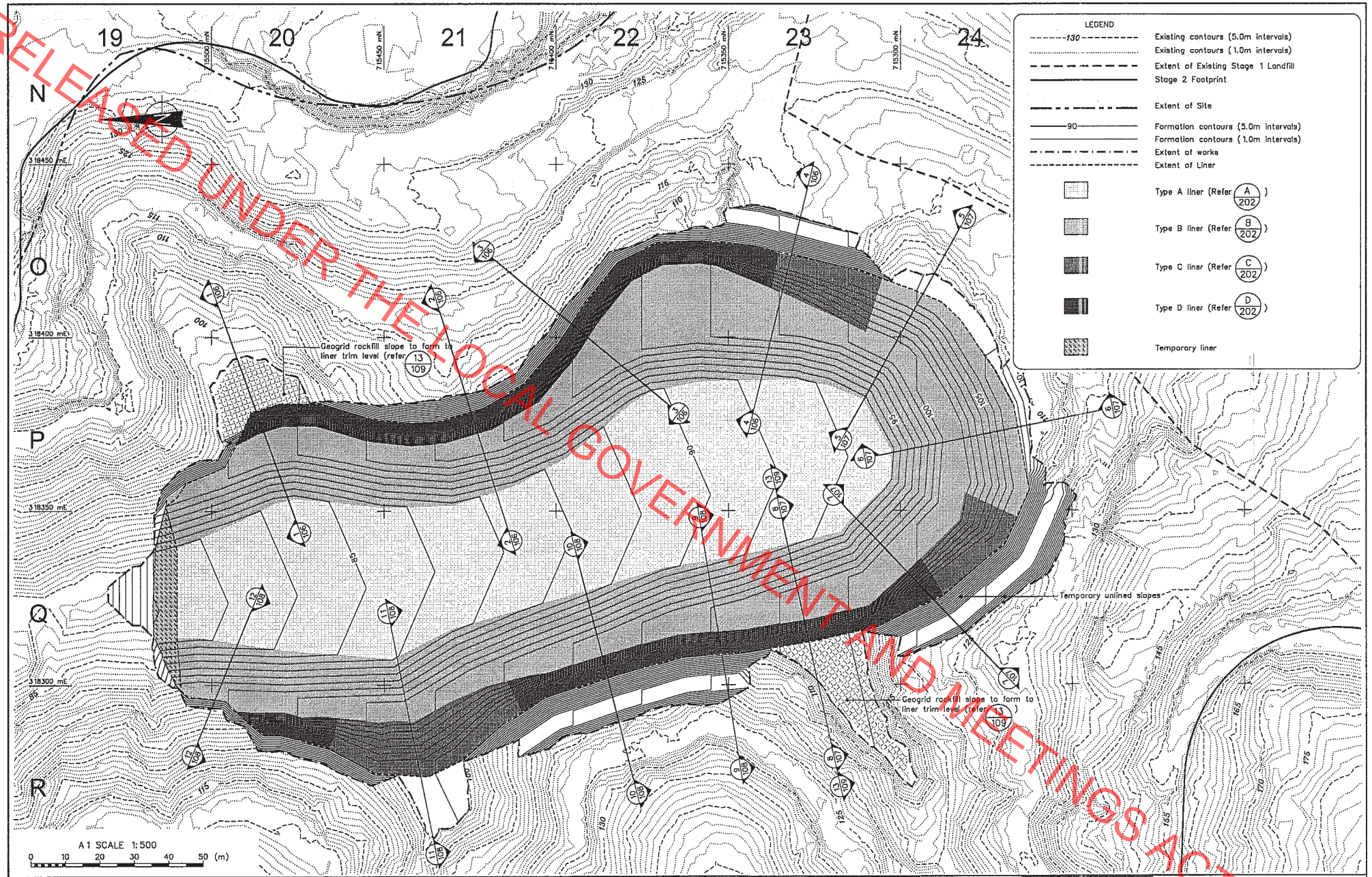
HUTT CITY
SILVERSTREAM LANDFILL
SS2 Contract: AD 16 3624

TITLE
PHASE 1 BASE, SLOPES 1 & 2
Access Road Cross – Typical Sections

SCALES (AT A1 SIZE) AS SHOWN
DWG. No. 8309 1.400–FOR 115
REV. A

P:\83091\83091.402\WorkingMaterial\CAD\Design Dwgs\83091.400-FOR115.dwg, 115, 19/07/2006 5:50:14 p., sjs, 1:2



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REVISION	DESCRIPTION	BY	DATE
A	Tender Issue		

DESIGNED :	SJS	June.06
DRAWN :	RDB	June.06
DESIGN CHECKED :		
DRAFTING CHECKED :		
CADFILE : P:\8309 1\..\8309 1.402–LNR20 1		
APPROVED :		

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NOTES :
1. All dimensions are in millimetres unless noted otherwise.
2. Coordinates:
Coordinate Datum: NZ Geodetic 1949 Wellington Circuit Coordinates
Origin: Mt Cook 700,000 mN 300,000 mE
Level Datum: LINZ (MSL).
3. Existing ground contours created from Airborne Laser Scanning data flown 2 August 2005. Data provided by AAMHATCH Pty Ltd, Reference: 2 10 1 1 190 Inob.

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HUTT CITY

SILVERSTREAM LANDFILL
SS2 Contract AD 16 3624

TITLE
PHASE 1 BASE, SLOPES 1 & 2
Liner Layout – Plan

SCALES (AT A1 SIZE)	DWG. No.	REV.
1:500	8309 1.402–LNR20 1	A

P:\83091\83091.402\WorkingMaterial\CAD\Design Dwgs\83091.400-LNR201.dwg, 201, 19/07/2006 5:50:27 p, sjs, 1:2

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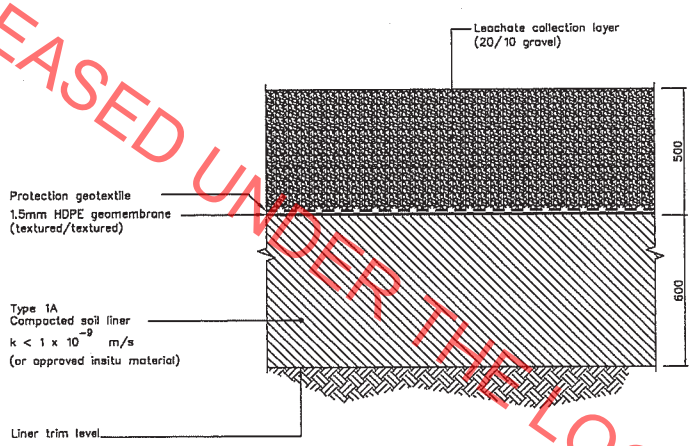
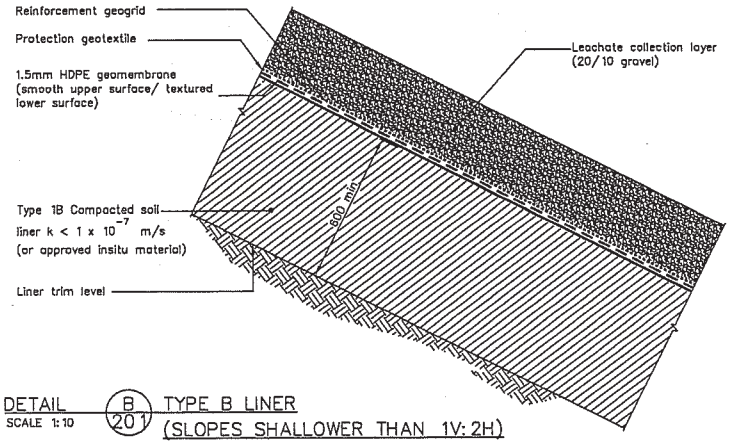
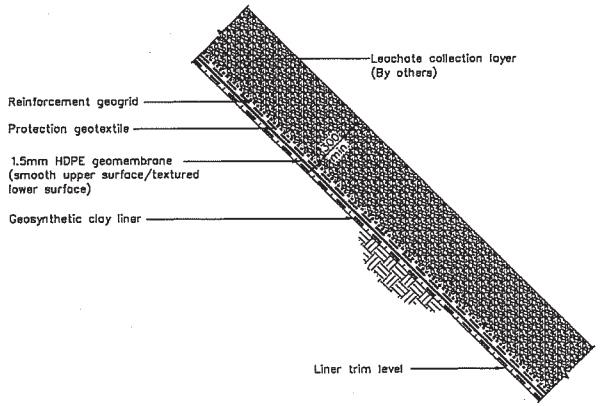


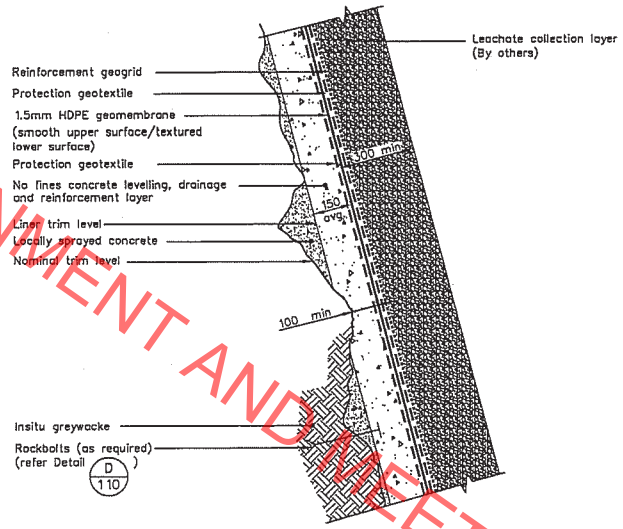
DETAIL SCALE 1:10 — A/201 — TYPE A LINER (BASE)



DETAIL SCALE 1:10 — B/201 — TYPE B LINER (SLOPES SHALLOWER THAN 1V:2H)



DETAIL SCALE 1:10 — C/201 — TYPE C LINER SLOPES BETWEEN 1V:2H to 1V:1H



DETAIL SCALE 1:10 — D/201 — TYPE D LINER (SLOPES STEEPER THAN 1V:1H)

A1 SCALE 1:10
0 0.2 0.4 0.5 0.8 1.0 (m)

REVISION DESCRIPTION	BY	DATE
A Tender Issue		

DESIGNED : SJS May.06
DRAWN : FFAN May.06
DESIGN CHECKED :
DRAFTING CHECKED :
CADFILE : P:\83..\8309 1.400-LNR202_206
APPROVED :
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HUTT CITY
SILVERSTREAM LANDFILL
SS2 Contract: AD 16 3624

TITLE
PHASE 1 BASE, SLOPES 1 & 2
Liner Types

SCALES (AT A1 SIZE) 1:10
DWG. No. 8309 1.400-LNR202
REV. A

P:\83091\83091.402\WorkingMaterial\CAD\Design Dwgs\83091.400-LNR202_206.dwg, 202, 19/07/2006 5:50:39 p., 5j5, 1:2

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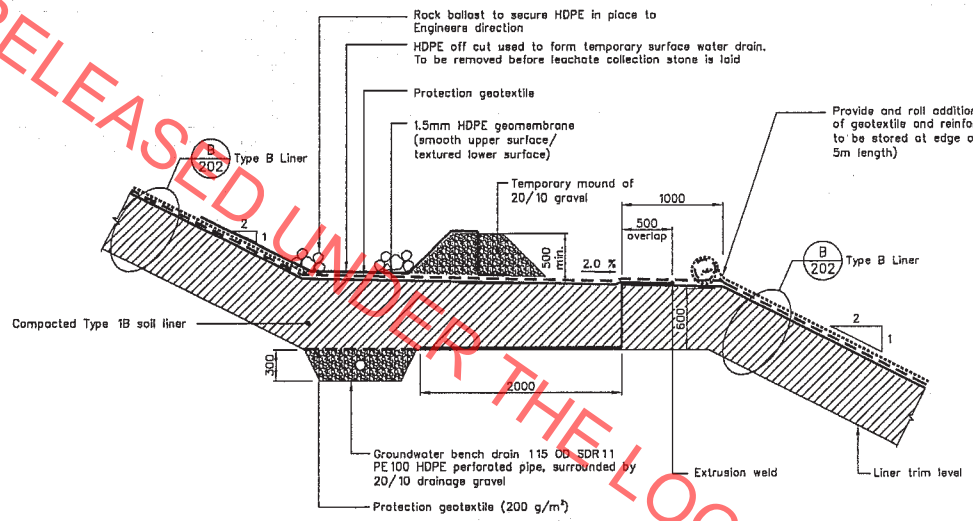
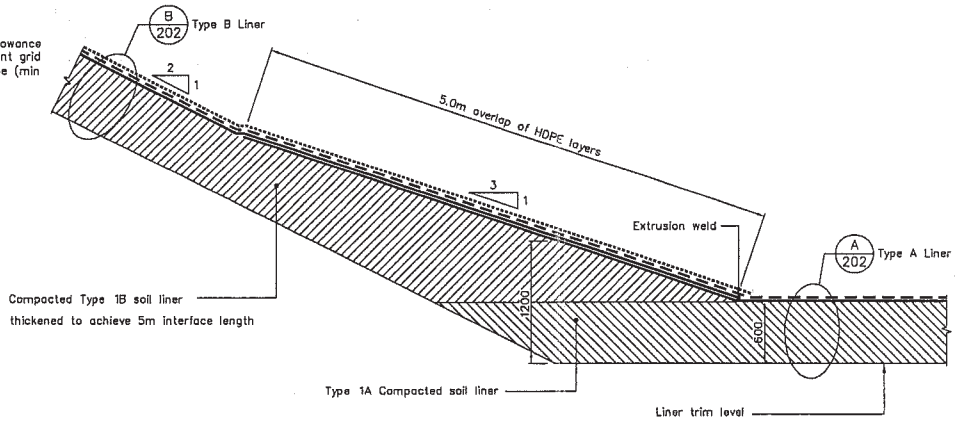
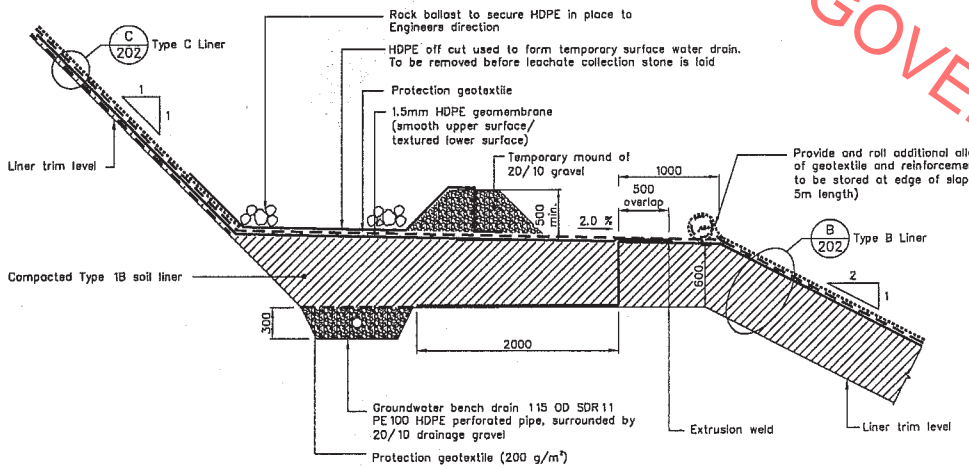


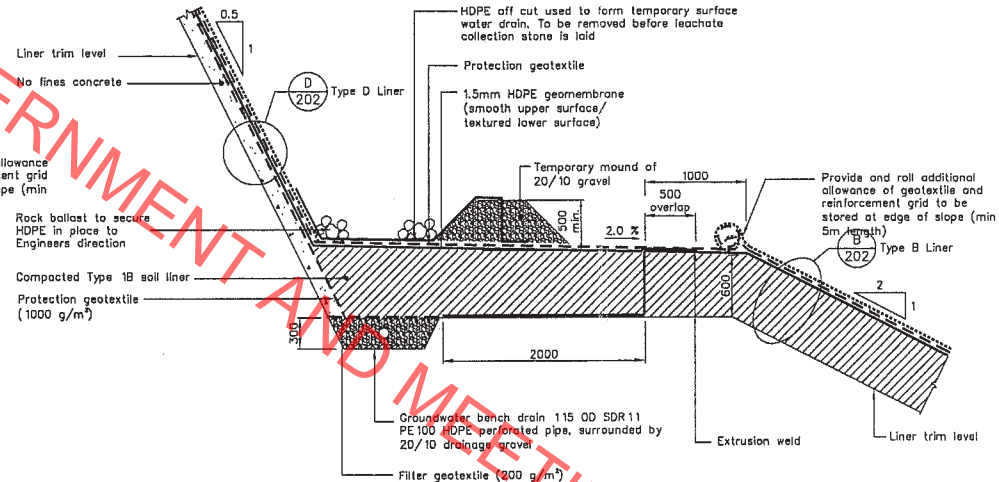
DETAIL SCALE 1:25 — F 105 — TYPE B – TYPE B LINER BENCH



DETAIL SCALE 1:25 — H 105 — TYPE A – TYPE B LINER INTERFACE



DETAIL SCALE 1:25 — F 105 — TYPE B – TYPE C LINER BENCH



DETAIL SCALE 1:25 — G 105 — TYPE B – TYPE D LINER BENCH

A1 SCALE 1:25

0 0.5 1.0 1.5 2.0 2.5 (m)

			DESIGNED :	SJS	May.06
			DRAWN :	FFAN	May.06
			DESIGN CHECKED :		
			DRAFTING CHECKED :		
			CADFILE : P:\83..\8309 1.400-LNR202_206		
			APPROVED : NOT FOR CONSTRUCTION		
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HUTT CITY

SILVERSTREAM LANDFILL
SS2 Contract: AD 16 3624

TITLE
PHASE 1 BASE, SLOPES 1 & 2
Liner Details (Sheet 1 of 4)

SCALES (AT A1 SIZE) 1:25
DWG. No. 8309 1.400-LNR203
REV. A

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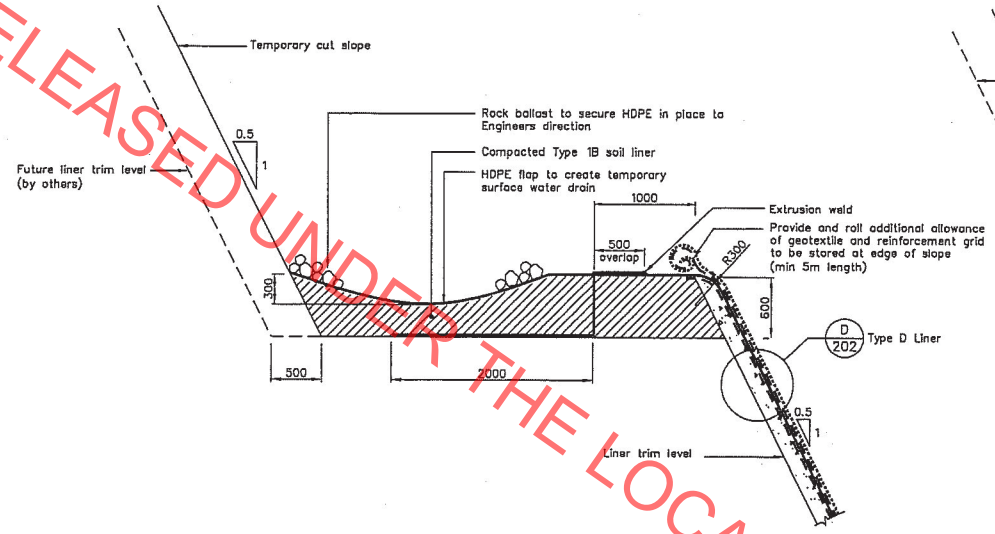
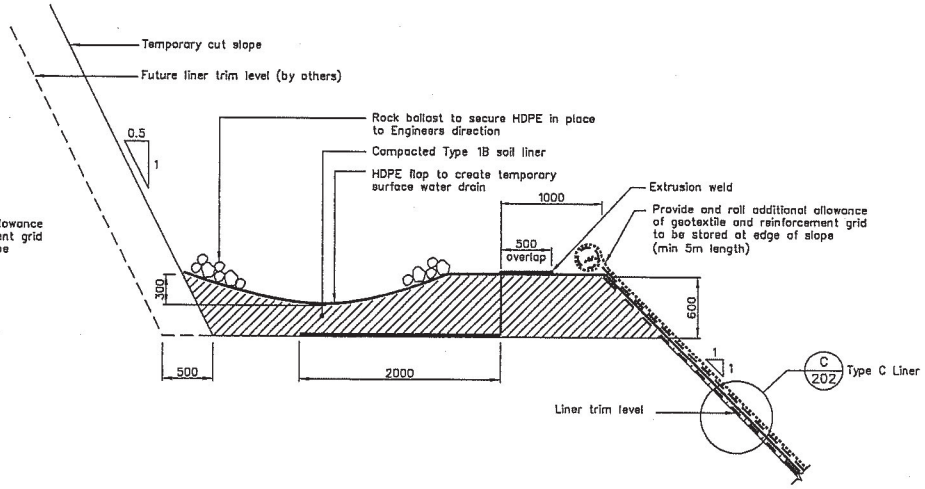
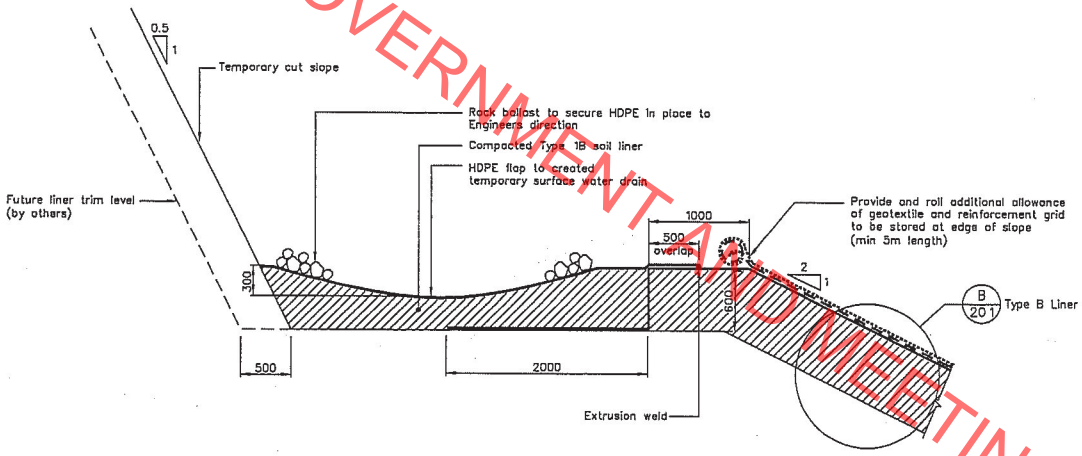


DETAIL I 106 SCALE 1:25 TEMPORARY SURFACE WATER DRAIN ABOVE TYPE D LINER



DETAIL J 106 SCALE 1:25 TEMPORARY SURFACE WATER DRAIN ABOVE TYPE C LINER



DETAIL K 107 SCALE 1:25 TEMPORARY SURFACE WATER DRAIN ABOVE TYPE B LINER

A1 SCALE 1:25
0 0.5 1.0 1.5 2.0 2.5 (m)

REVISION DESCRIPTION	BY	DATE
A Tender Issue		

DESIGNED : SJS May.06
DRAWN : FFAN May.06
DESIGN CHECKED :
DRAFTING CHECKED :
CADFILE : P:\83..\8309 1.400-LNR202_206
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NOTES :
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HUTT CITY
SILVERSTREAM LANDFILL
SS2 Contract: AD 16 3624

TITLE
PHASE 1 BASE, SLOPES 1 & 2
Liner Details (Sheet 2 of 4)

SCALES (AT A1 SIZE) 1:25
DWG. No. 8309 1.400-LNR204
REV. A

P:\83091\83091.402\WorkingMaterial\CAD\Design Dwgs\83091.400-LNR202_206.dwg, 204, 19/07/2006 5:50:41 p, sjs, 1:2

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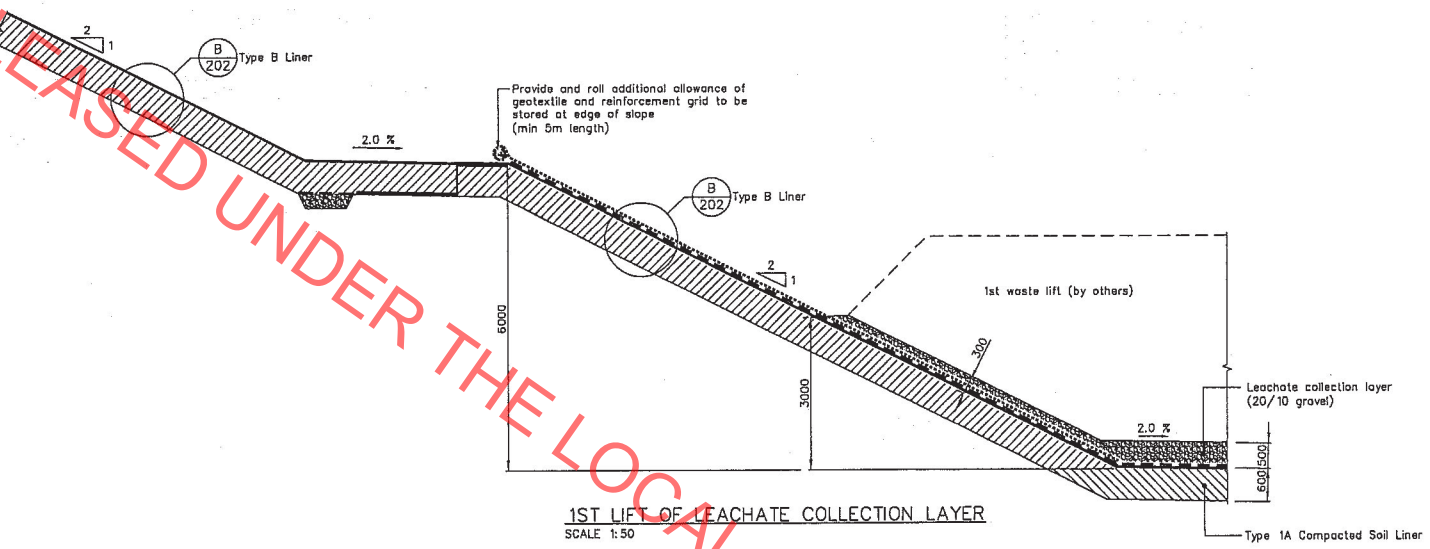
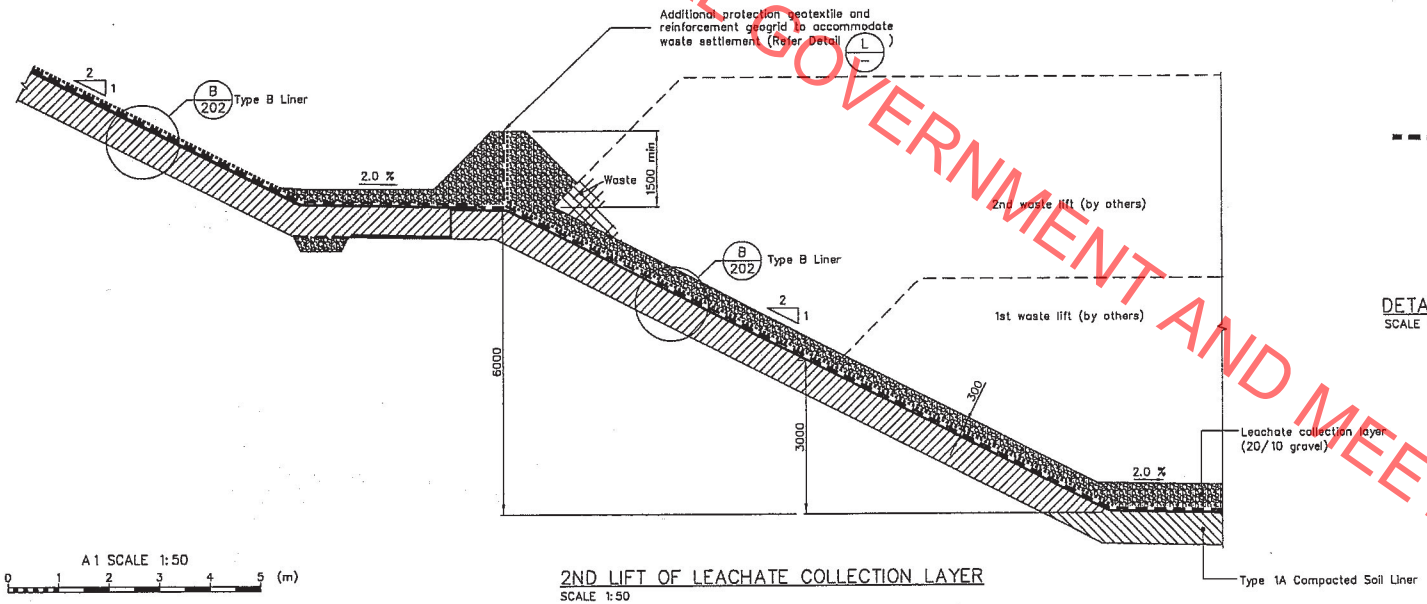
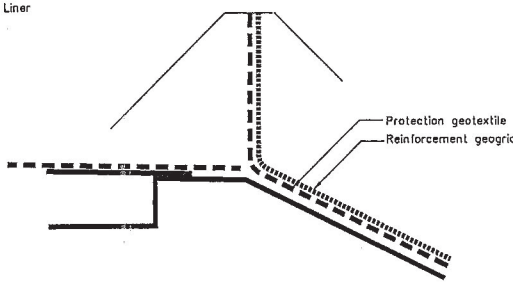


1ST LIFT OF LEACHATE COLLECTION LAYER
SCALE 1:50



A1 SCALE 1:50
0 1 2 3 4 5 (m)

2ND LIFT OF LEACHATE COLLECTION LAYER
SCALE 1:50
FOR INFORMATION ONLY – 2ND LIFT NOT IN CONTRACT



DETAIL L ADDITIONAL PROTECTION MATERIAL WITHIN GRAVEL MOUND
SCALE 1:25
FOR INFORMATION ONLY – NOT IN CONTRACT

DESIGNED :	SJS	May.06	
DRAWN :	FFAN	May.06	
DESIGN CHECKED :			
DRAFTING CHECKED :			
CADFILE : P:\83..\8309 1.400-LNR202_206			
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SILVERSTREAM LANDFILL
SS2 Contract: AD 16 3624

TITLE
PHASE 1 BASE, SLOPES 1 & 2
Liner Details (Sheet 3 of 4)

SCALES (AT A1 SIZE) AS SHOWN
DWG. No. 8309 1.400-LNR205
REV. A

P:\83091\83091.402\WorkingMaterial\CAD\Design Dwgs\83091.400-LNR202_206.dwg, 205, 19/07/2006 5:50:43 p., sjs, 1:2

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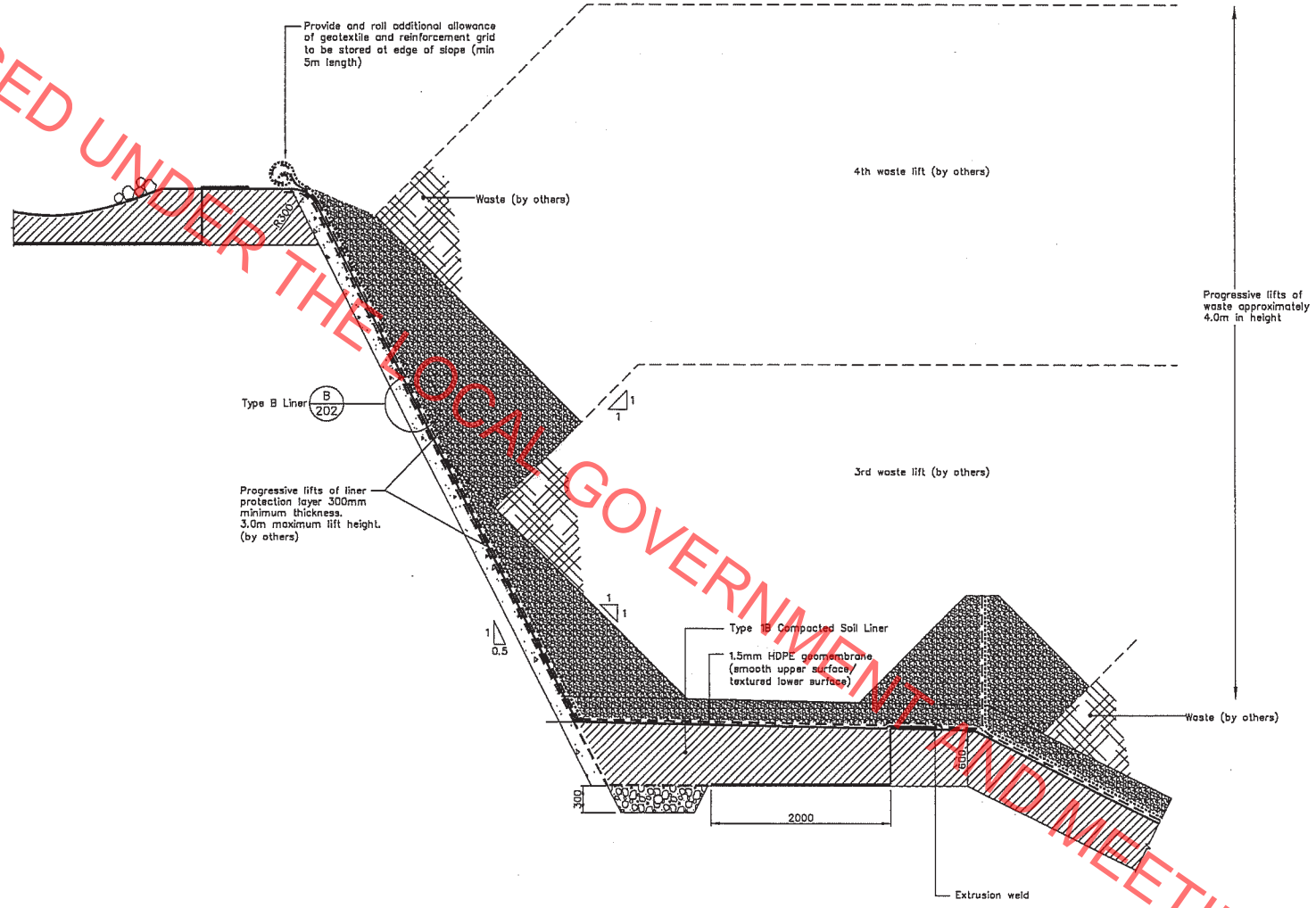

SECTION 2/105 PLACEMENT OF LEACHATE COLLECTION LAYER ON SLOPES STEEPER THAN 1V: 1H
SCALE 1:25

A1 SCALE 1:25
0 0,5 1,0 1,5 2,0 2,5 (m)

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A	Tender Issue		

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DRAWN : FFAN May.06
DESIGN CHECKED :
DRAFTING CHECKED :
CADFILE : P:\8J..\8309 1.400–LNR202_206
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SILVERSTREAM LANDFILL
SS2 Contract: AD 16 3624

TITLE
PHASE 1 BASE, SLOPES 1 & 2
Liner Details (Sheet 4 of 4)

SCALES (AT A1 SIZE) 1: 25
DWG. No. 8309 1.400–LNR206
REV. A

P:\83091\83091.402\WorkingMaterial\CAD\Design Dwgs\83091.400-LNR202_206.dwg, 206, 19/07/2006 5:50:44 p., sjs, 1:2

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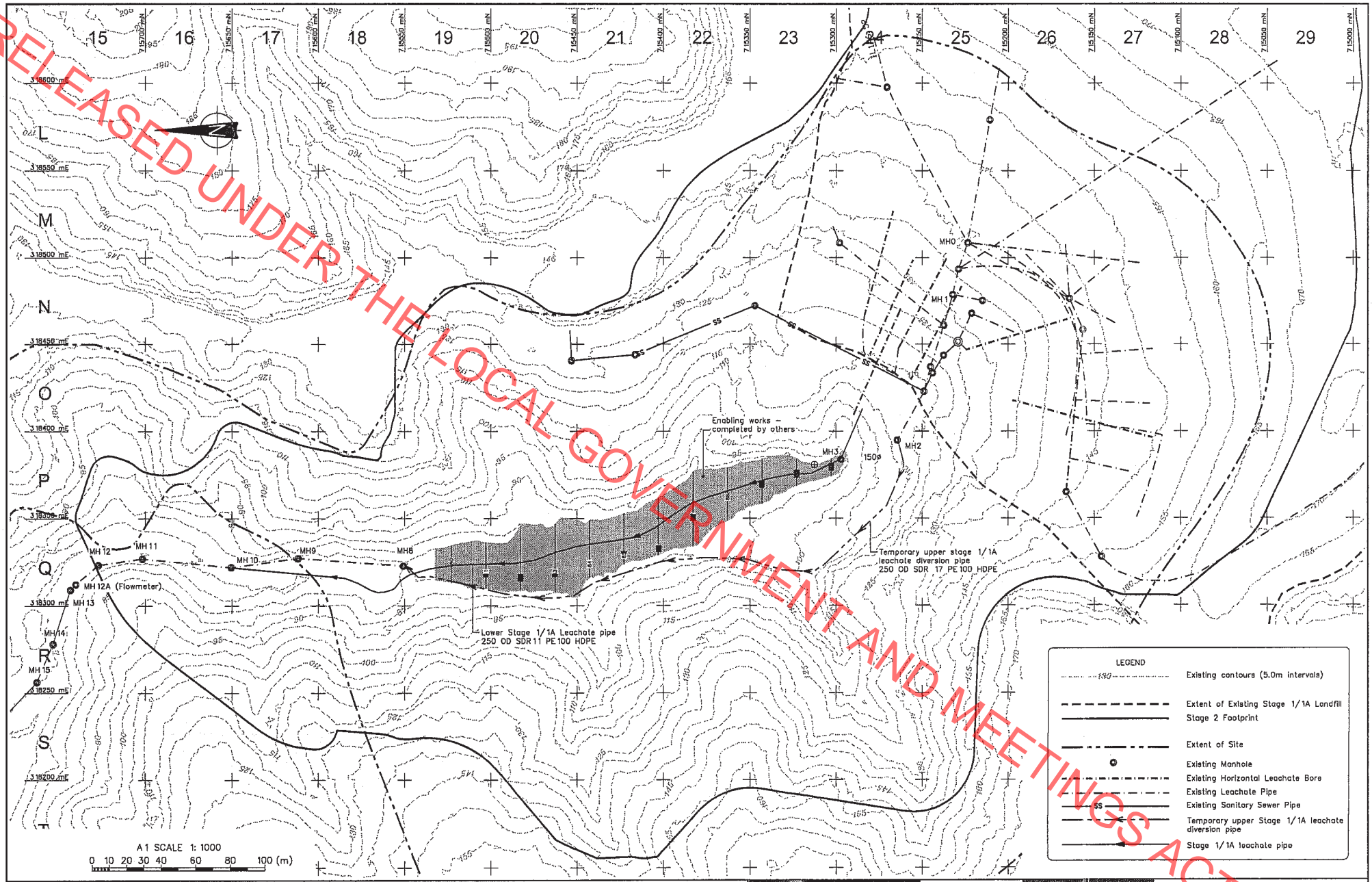

REVISION	DESCRIPTION	BY	DATE
A	Tender Issue		

DESIGNED :	SJS	Jun.06
DRAWN :	FFAN	Jun.06
DESIGN CHECKED :		
DRAFTING CHECKED :		
CADFILE : P:\8309 1\..\8309 1.400-LCS301		
APPROVED : NOT FOR CONSTRUCTION		

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NOTES :

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2. Coordinates:
   Coordinate Datum: NZ Geodetic 1949 Wellington Circuit Coordinates
   Origin: Mt Cook 700,000 mN 300,000 mE
   Level Datum: LINZ (MSL).
3. Existing ground contours created from Airborne Laser Scanning data flown 2 August 2005. Data provided by AAMHATCH Pty Ltd, Reference: 2 10 1 1 190 1nob.

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HUTT CITY

SILVERSTREAM LANDFILL
SS2 Contract: AD 16 3264

TITLE
PHASE 1 BASE, SLOPES 1 & 2
Existing Leachate Drainage Plan

SCALES (AT A1 SIZE)	DWG. No.	REV.
1: 1000	8309 1.400-LCS301	A

P:\83091\83091.402\WorkingMaterial\CAD\Design Dwgs\83091.400-LCS301.dwg, 301, 19/07/2006 5:50:54 p., sjs, 1:2

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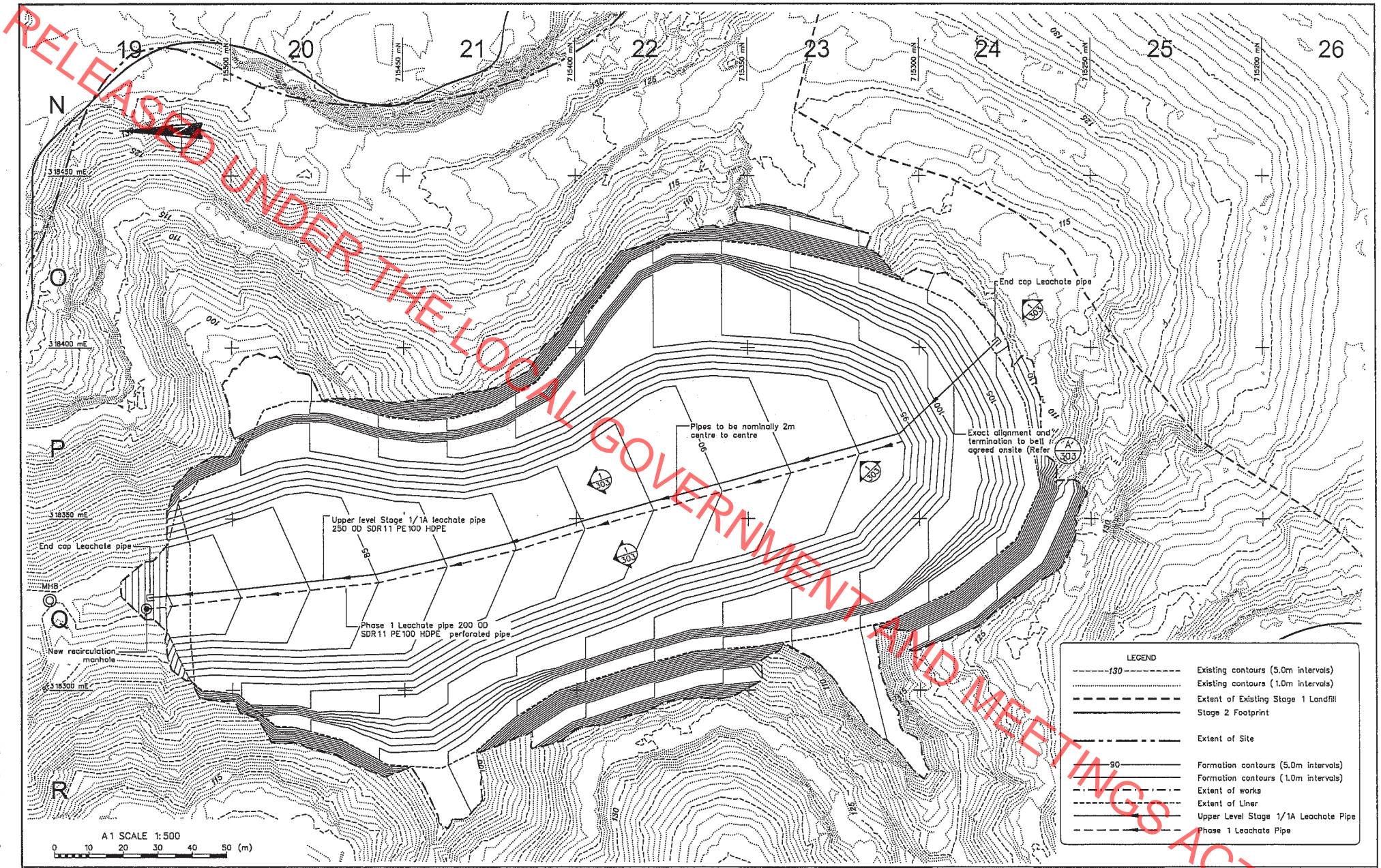

REVISION DESCRIPTION	BY	DATE
A Tender Issue		

DESIGNED : SJS May.06
DRAWN : FFAN May.06
DESIGN CHECKED :
DRAFTING CHECKED :
CADFILE : P:\83091\..\8309 1.400-LCS302
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1. All dimensions are in millimetres unless noted otherwise.
2. Coordinates:
Coordinate Datum: NZ Geodetic 1949 Wellington Circuit Coordinates
Origin: Mt Cook 700,000 mN 300,000 mE
Level Datum: LINZ (MSL).
3. Existing ground contours created from Airborne Laser Scanning data flown 2 August 2005. Data provided by AAMHATCH Pty Ltd, Reference: 2 10 11 190 Inob.

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HUTT CITY
SILVERSTREAM LANDFILL
SS2 Contract: AD 16 3624

TITLE
PHASE 1 BASE, SLOPES 1 & 2
Leachate Collection System Plan

SCALES (AT A1 SIZE) 1:500
DWG. No. 8309 1.400-LSC302
REV. A

P:\83091\83091.402\WorkingMaterial\CAD\Design Dwgs\83091.400-LCS302.dwg, 302, 19/07/2006 5:51:10 p., $$s 1:2

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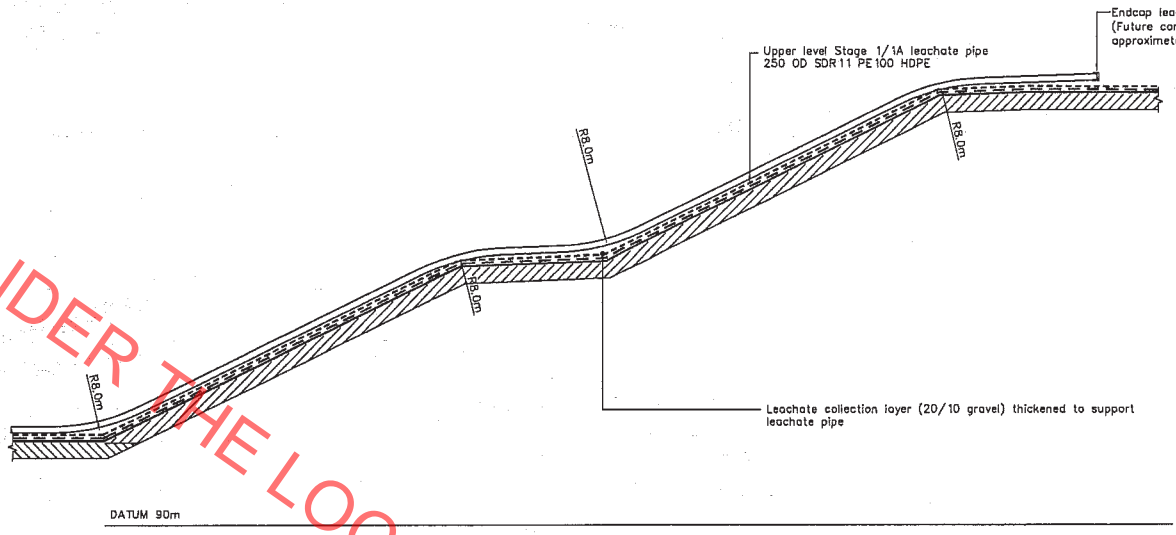
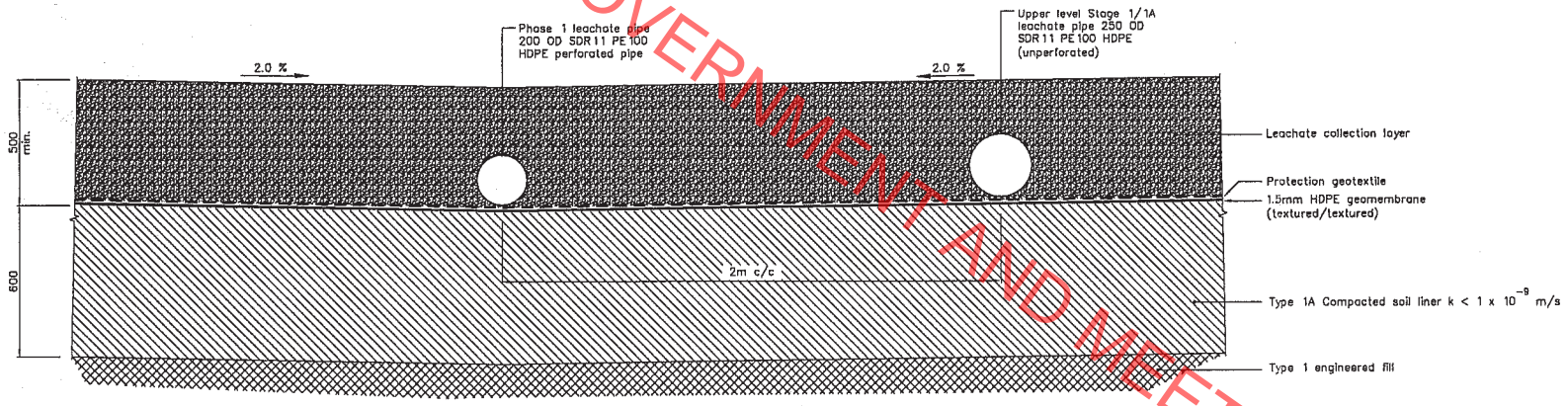


SECTION 2/302 TYPICAL PLACEMENT OF UPPER STAGE 1/1A LEACHATE PIPE ON PHASE 1 FORMATION SLOPES 1&2
SCALE 1:100



SECTION 1/302 PHASE 1 LEACHATE COLLECTION SYSTEM
SCALE 1:10

A1 SCALE 1:100
0 1 2 3 4 6 8 10 (m)

DESIGNED :	SJS	Jun.06	
DRAWN :	FFAN	Jun.06	
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DRAFTING CHECKED :			
CADFILE : P:\8309 1\..\8309 1.400-LCS303			
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HUTT CITY

SILVERSTREAM LANDFILL
SS2 Contract: AD 16 3624

TITLE
PHASE 1 BASE, SLOPES 1 & 2
Leachate Drainage Details

SCALES (AT A1 SIZE) AS SHOWN
DWG. No. 8309 1.400-LCS303
REV. A

P:\83091\83091.402\WorkingMaterial\CAD\Design Dwgs\83091.400-LCS303.dwg, 303, 19/07/2006 5:51:20 p., sjs, 1:2

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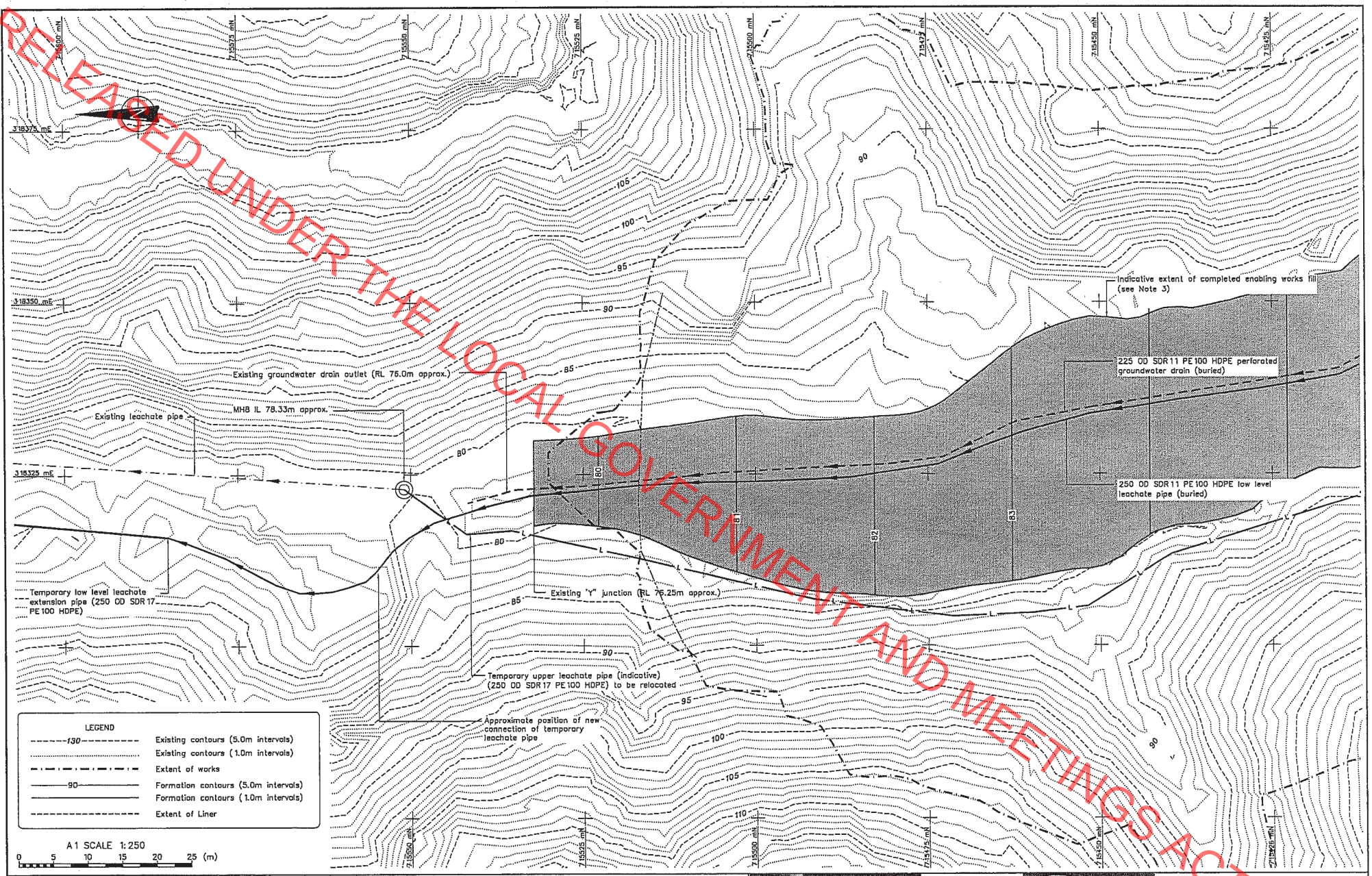

REVISION DESCRIPTION	BY	DATE
A Tender Issue		

DESIGNED :	SJS	Jun.06
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DRAFTING CHECKED :		
CADFILE : P:\8309 1\..\8309 1.400-TOE401		
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NOTES :

1. Coordinate Datum: NZ Geodetic 1949 Wellington Circuit Coordinates Origin: Mt Cook 700,000 mN 300,000 mE. Level Datum: LINZ (MSL) Wellington Vertical Datum 1953.
2. Existing ground contours created from Airborne Laser Scanning data flown 2 August 2005. Data provided by AAMHATCH Pty Ltd, Reference: 2 10 11 190 1nob.
3. Indicative extent of enabling works fill shown. Extent and level to be confirmed prior to contract commencement.

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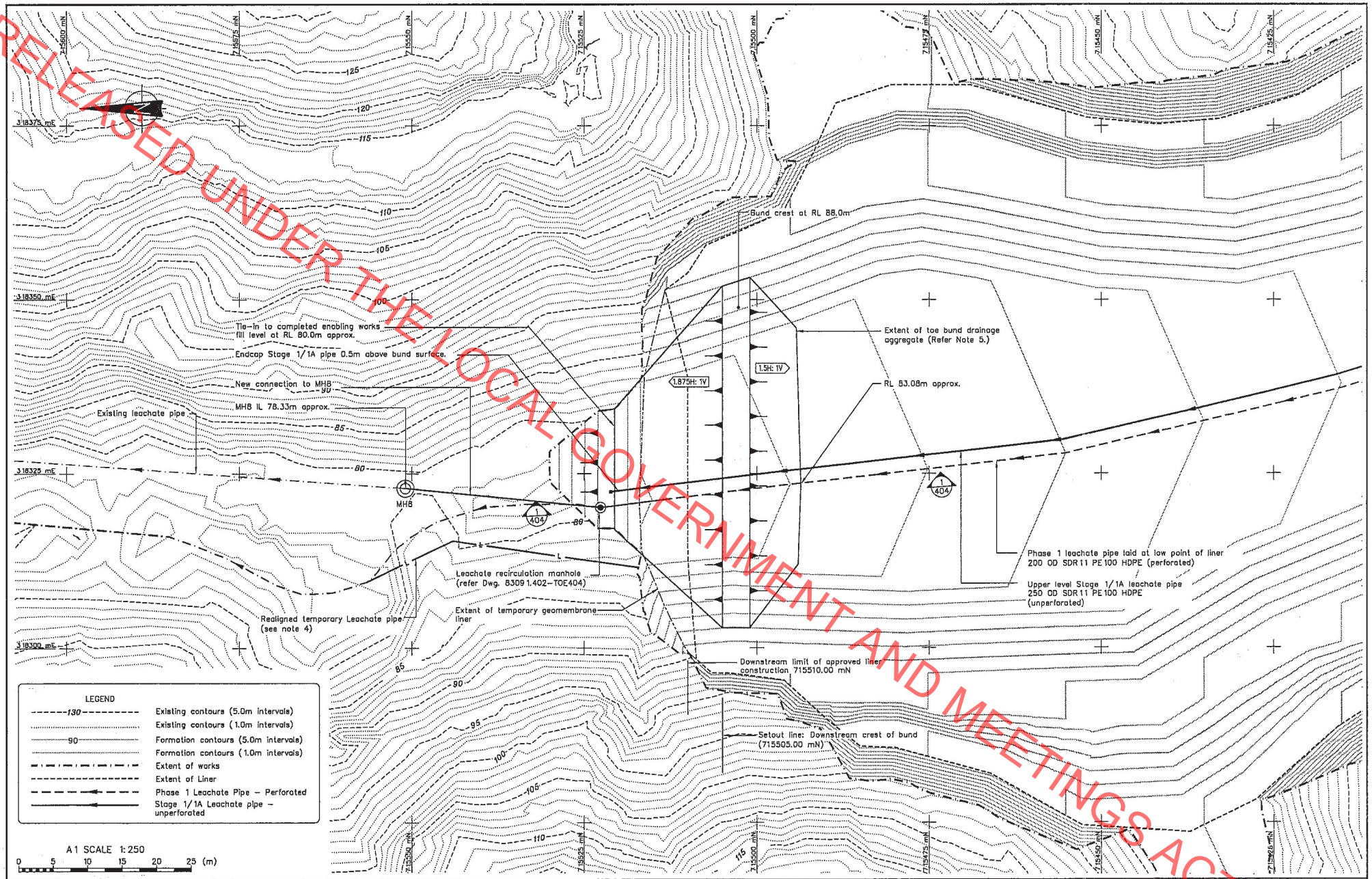
HUTT CITY

SILVERSTREAM LANDFILL
SS2 Contract: AD 16 3559

TITLE
PHASE 1 BASE, SLOPES 1 & 2
Completed Enabling Works

SCALES (AT A1 SIZE)	DWG. No.	REV.
1:250	8309 1.402-TOE401	A

P:\83091\83091.402\WorkingMaterial\CAD\Design Dwgs\83091.400-TOE401.dwg, 401, 19/07/2006 5:51:34 p., sjs, 1:2



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			DRAFTING CHECKED :		
			CADFILE : P:\8309 1\..\8309 1.400-TOE402		
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NOTES :
1. Coordinate Datum: NZ Geodetic 1949 Wellington Circuit Coordinates Origin: Mt Cook 700,000 mN 300,000 mE. Level Datum: LINZ (MSL) Wellington Vertical Datum 1953.
2. Existing ground contours created from Airborne Laser Scanning data flown 2 August 2005. Data provided by AAMHATCH Pty Ltd, Reference: 2 10 11 190 Inab.
3. Indicative extent of enabling works fill shown. Extent and level to be confirmed prior to contract commencement.
4. Position of realigned temporary leachate pipe to be confirmed on site by Engineer.
5. Base drainage blanket not shown for clarity (Refer Dwg. 403)

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HUTT CITY

SILVERSTREAM LANDFILL
SS2 Contract: AD 16 3559

TITLE
PHASE 1 BASE, SLOPES 1 & 2
Toe Bund Plan

SCALES (AT A1 SIZE)	DWG. No.	REV.
1:250	8309 1.402-TOE402	A

P:\83091\83091.402\WorkingMaterial\CAD\Design Dwgs\83091.400-TOE402.dwg, 402, 19/07/2006 5:51:59 p., sjs, 1:2

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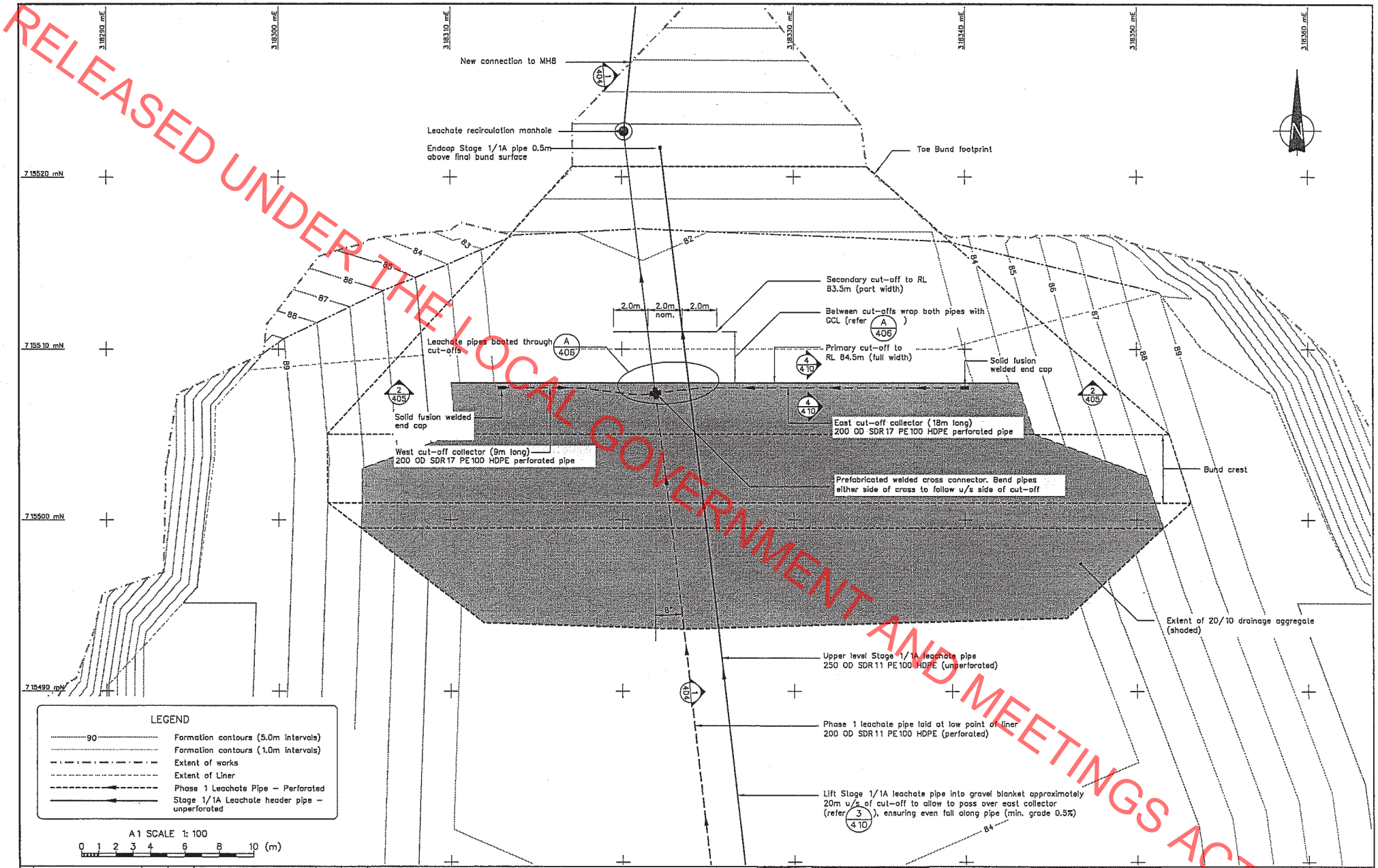

DESIGNED :	APK	Jun.06	
DRAWN :	FFAN	Jun.06	
DESIGN CHECKED :			
DRAFTING CHECKED :			
CADFILE : P:\8309 1\..\8309 1.400-TOE403			
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HUTT CITY

SILVERSTREAM LANDFILL
SS2 Contract: AD 16 3624

TITLE
PHASE 1 BASE, SLOPES 1 & 2
Toe Bund Internal Drainage Plan

SCALES (AT A1 SIZE)	DWG. No.	REV.
1: 100	8309 1.400-TOE403	A

P:\83091\83091.402\WorkingMaterial\CAD\Design Dwgs\83091.400-TOE403.dwg, 403, 19/07/2006 5:52:13 p., sjs, 1:2

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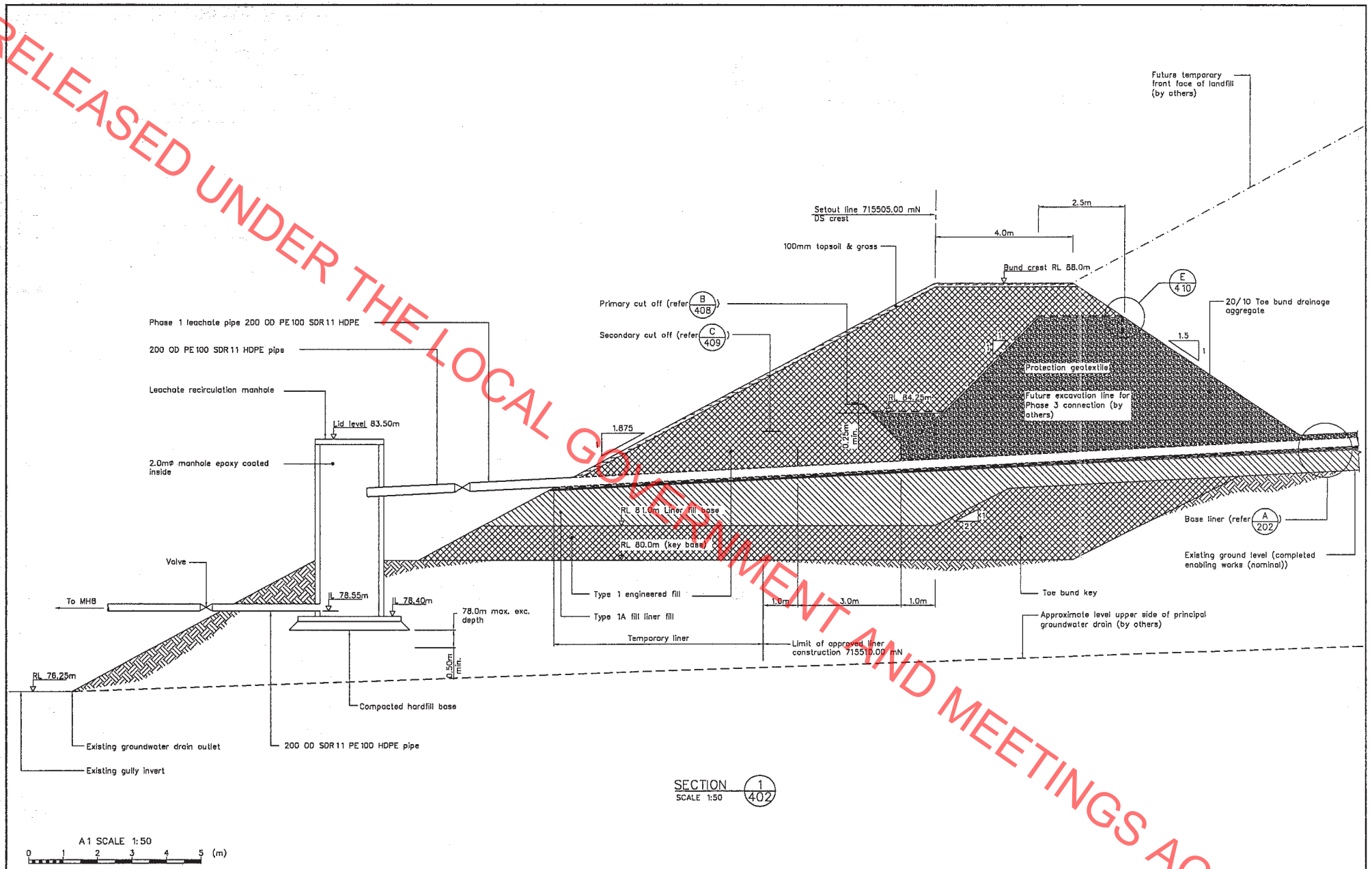

SECTION 1 / 402
SCALE 1:50

A1 SCALE 1:50
0 1 2 3 4 5 (m)

			DESIGNED :	APK	Jun.06
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			DESIGN CHECKED :		
			DRAFTING CHECKED :		
			CADFILE : P:\8309 1\..\8309 1.400-TOE404		
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2. Completed enabling works to be confirmed.
3. Connection detail for 200 leachate main from reticulation manhole to MH8 to be confirmed onsite by Engineer.
4. Upper level Stage 1/1A leachate pipe (behind) & cut-off collection connector not shown for clarity.

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HUTT CITY
SILVERSTREAM LANDFILL
SS2 Contract AD 16 3624

TITLE
PHASE 1 BASE, SLOPES 1 & 2
Toe Bund Sections (sheet 1 of 2)

SCALES (AT A1 SIZE)	DWG. No.	REV.
1:50	8309 1.400-TOE404	A

P:\83091\83091.402\WorkingMaterial\CAD\Design Dwgs\83091.400-TOE404.dwg, 404, 19/07/2006 5:52:18 p., 95, 1:2

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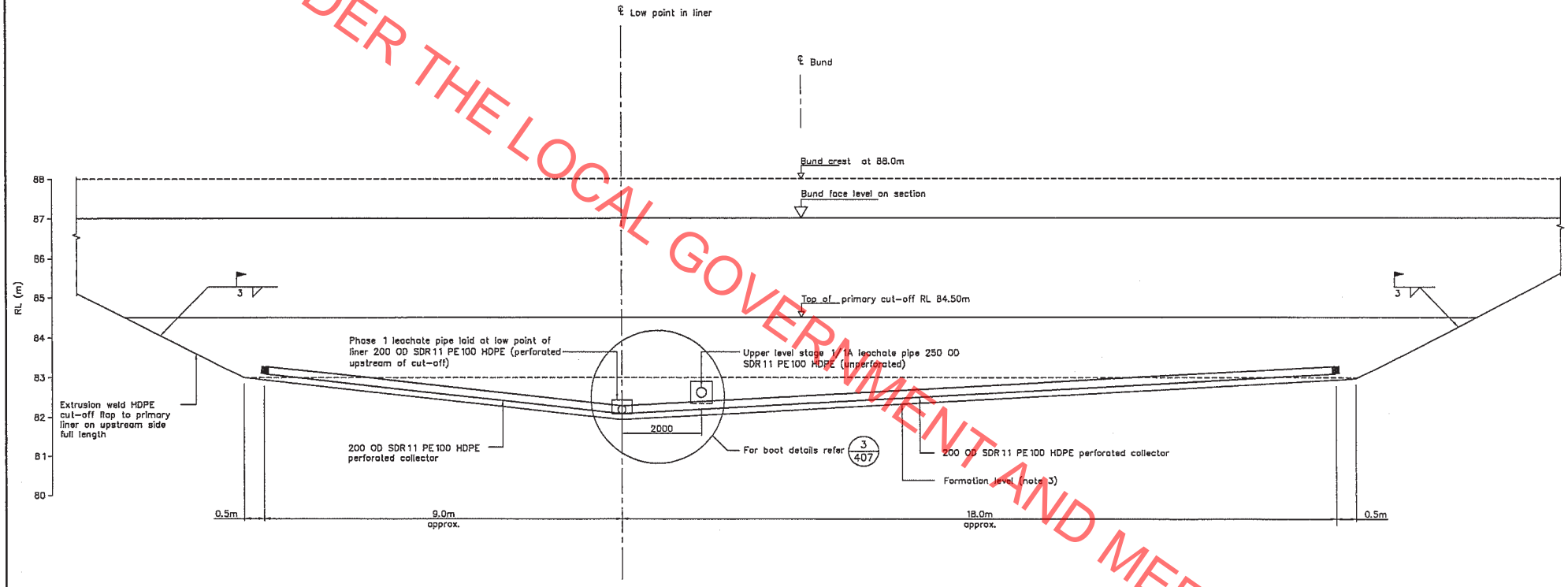

SECTION 2/403 TOE BUND – THROUGH PRIMARY CUT-OFF COLLECTOR
SCALE 1:50

A1 SCALE 1:50
0 1 2 3 4 5 (m)

REVISION	DESCRIPTION	BY	DATE
A	Tender Issue		

DESIGNED : APK Jun.06
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DESIGN CHECKED :
DRAFTING CHECKED :
CADFILE : P:\8309 1\..\8309 1.400-TOE405
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2. Liner layers and drainage materials not shown for clarity.

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SILVERSTREAM LANDFILL
SS2 Contract: AD 16 3624

TITLE
PHASE 1 BASE, SLOPES 1 & 2
Toe Bund Sections (sheet 2 of 2)

SCALES (AT A1 SIZE) 1: 100
DWG. No. 8309 1.400-TOE405
REV. A

P:\83091\83091.402\WorkingMaterial\CAD\Design Dwgs\83091.400-TOE405.dwg, 405, 19/07/2006 5:52:22 p., sjs, 1:2

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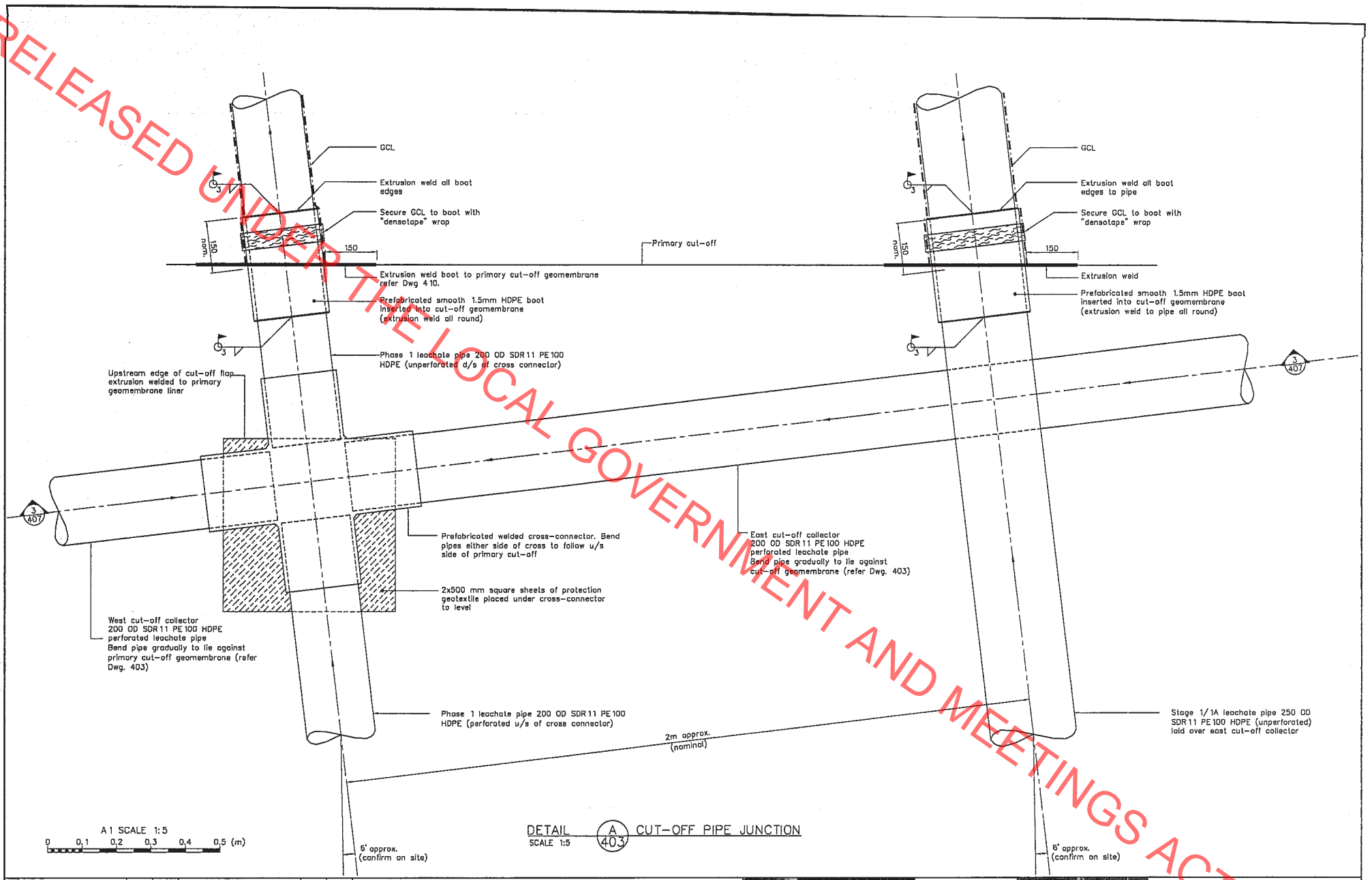

DETAIL A 403 CUT-OFF PIPE JUNCTION
SCALE 1:5

REVISION DESCRIPTION	BY	DATE
A Tender Issue		

DESIGNED : APK Jun.06
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CADFILE : P:\83..\8309 1.400-TOE406_110
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TITLE
PHASE 1 BASE, SLOPES 1 & 2
Toe Bund Details (sheet 1 of 5)

SCALES (AT A1 SIZE) 1:5
DWG. No. 8309 1.400-TOE406
REV. A

P:\83091\83091.402\WorkingMaterial\CAD\Design Dwgs\83091.400-TOE406_110.dwg, 406, 19/07/2006 5:52:27 p., sjs, 1:2

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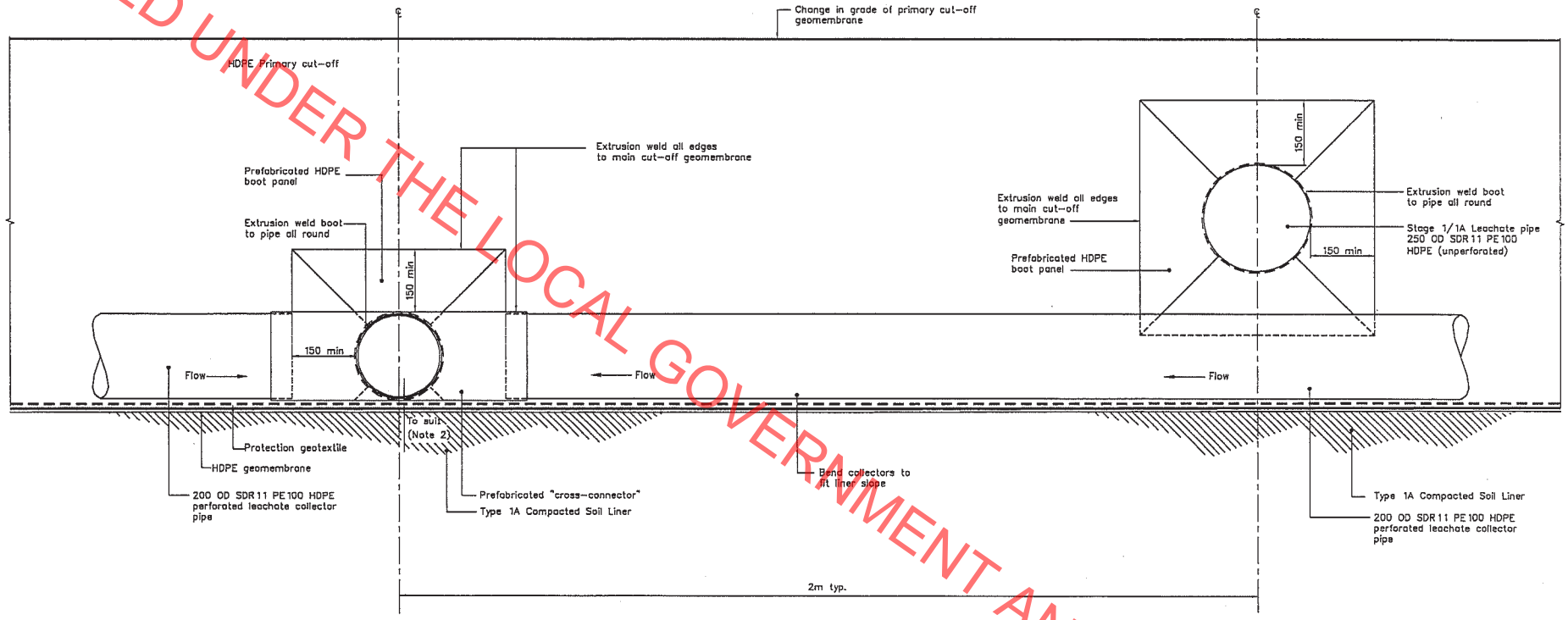

SECTION 3/406
SCALE 1:5

A1 SCALE 1:5
0 0.1 0.2 0.3 0.4 0.5 (m)

P:\83091\83091.402\WorkingMaterial\CAD\Design Dwgs\83091.400-TOE406_110.dwg, 407, 19/07/2006 5:52:28 p., sjs, 1:2

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			CADFILE : P:\83..\8309 1.400-TOE406_110		
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NOTES :
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2. Additional geotextile packing beneath cross-connectors not shown for clarity.

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HUTT CITY
SILVERSTREAM LANDFILL
SS2 Contract: AD 16 3624

TITLE
PHASE 1 BASE, SLOPES 1 & 2
Toe Bund Details (sheet 5 of 5)

SCALES (AT A1 SIZE) 1:5
DRG. No. 8309 1.400-TOE407
REV. A

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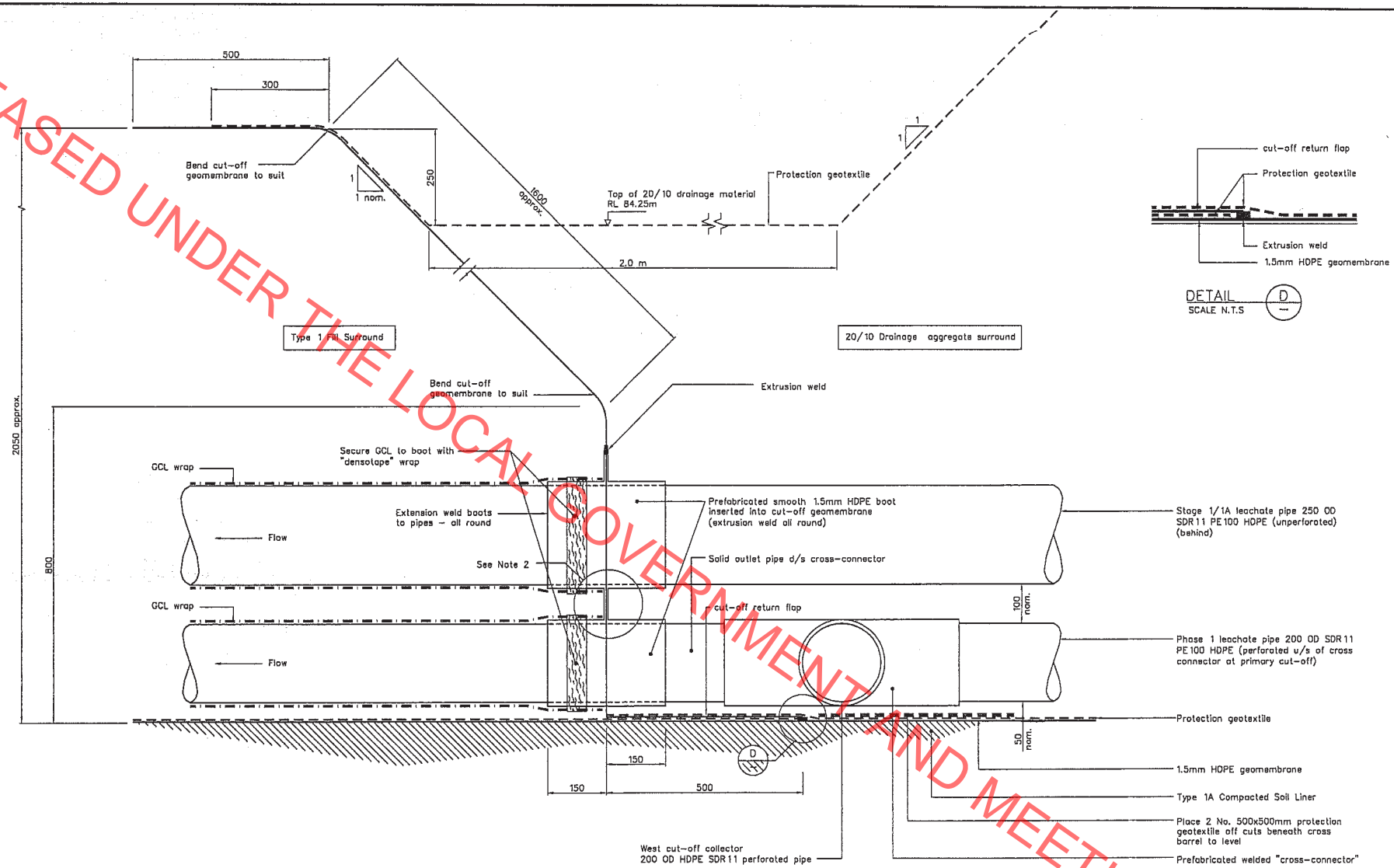

DETAIL D SCALE N.T.S

DETAIL B (404) SCALE 1:5 PRIMARY CUT-OFF DETAIL

A1 SCALE 1:5

0 0,1 0,2 0,3 0,4 0,5 (m)

REVISION DESCRIPTION	BY	DATE
A Tender Issue		

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DRAFTING CHECKED :
CADFILE : P:\83..\8309 1.400-TOE406_110
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NOTES :
1. All dimensions are in millimetres unless noted otherwise.
2. 250 OD Stage 1/1A leachate pipe is 2.0m east of Phase 1 leachate pipe and requires separate boot.
3. Pipe surround material not shown for clarity.

REFERENCE :

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HUTT CITY

SILVERSTREAM LANDFILL
SS2 Contract: AD 16 3624

TITLE
PHASE 1 BASE, SLOPES 1 & 2
Toe Bund Details (sheet 2 of 5)

SCALES (AT A1 SIZE) 1:5
DWG. No. 8309 1.400-TOE408
REV. A

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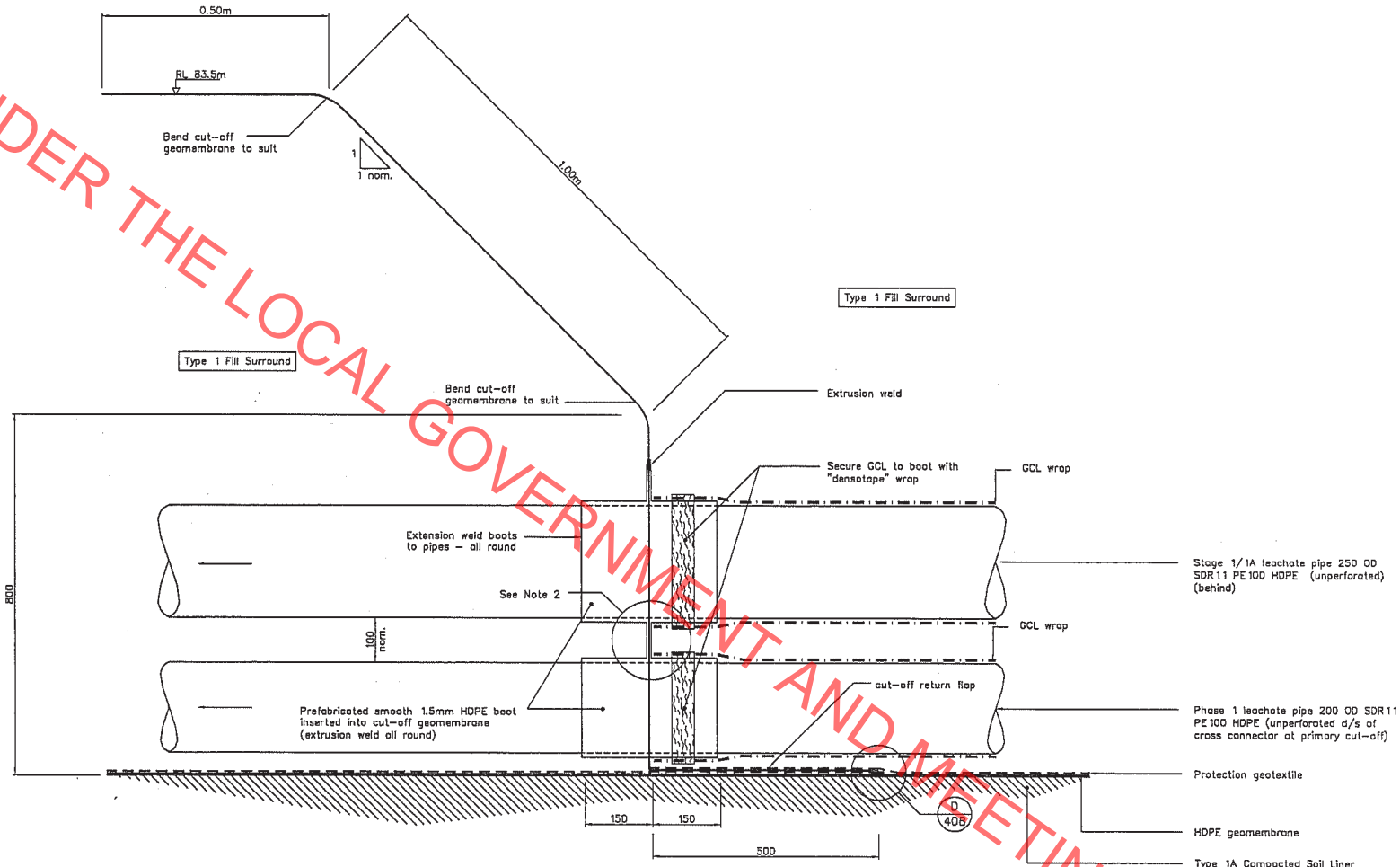

DETAIL C 404 SECONDARY CUT-OFF DETAIL
SCALE 1:5

A1 SCALE 1:5
0 0.1 0.2 0.3 0.4 0.5 (m)

REVISION	DESCRIPTION	BY	DATE
A	Tender Issue		

DESIGNED : APK Jun.06
DRAWN : FFAN Jun.06
DESIGN CHECKED :
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SILVERSTREAM LANDFILL
SS2 Contract: AD 16 3624

TITLE
PHASE 1 BASE, SLOPES 1 & 2
Toe Bund Details (sheet 3 of 5)

SCALES (AT A1 SIZE) 1:5
DWG. No. 8309 1.400-TOE409
REV. A

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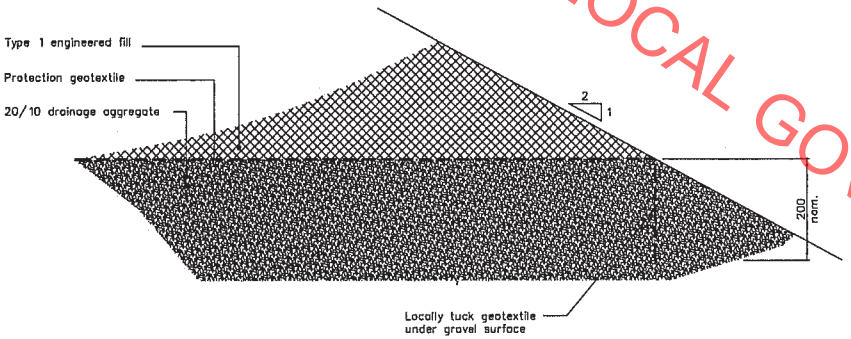
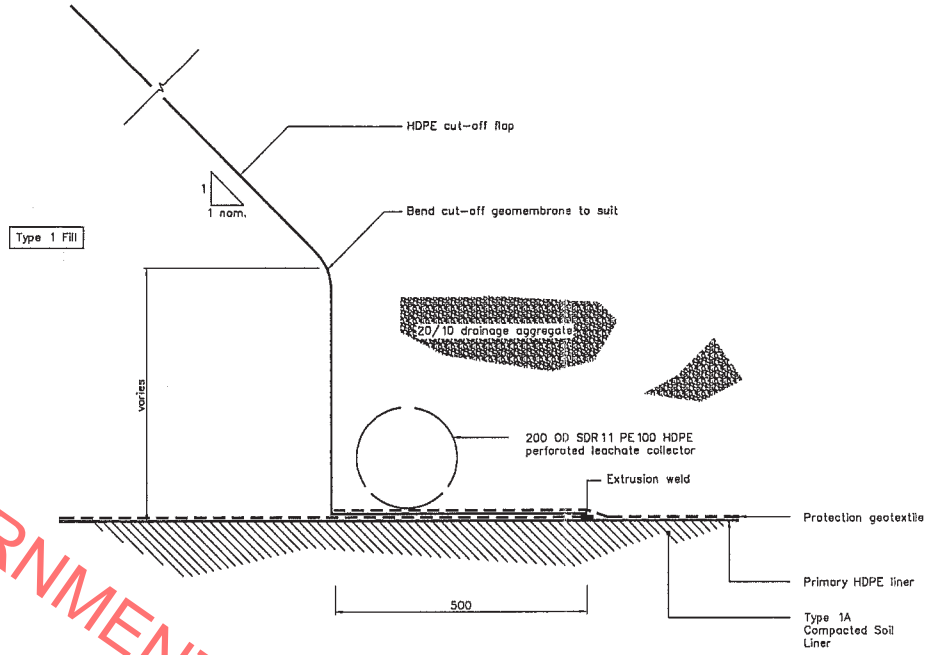


DETAIL E (404) EDGE DETAIL
SCALE 1:5



SECTION 4 (403) EDGE DETAIL
SCALE 1:5

A1 SCALE 1:5
0 0.1 0.2 0.3 0.4 0.5 (m)

REVISION DESCRIPTION	BY	DATE
A Tender Issue		

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DRAFTING CHECKED :		
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SILVERSTREAM LANDFILL
SS2 Contract: AD 16 3624

TITLE
PHASE 1 BASE, SLOPES 1 & 2
Toe Bund Details (sheet 4 of 5)

SCALES (AT A1 SIZE)	DWG. No.	REV.
1:5	8309 1.400-TOE4 10	A

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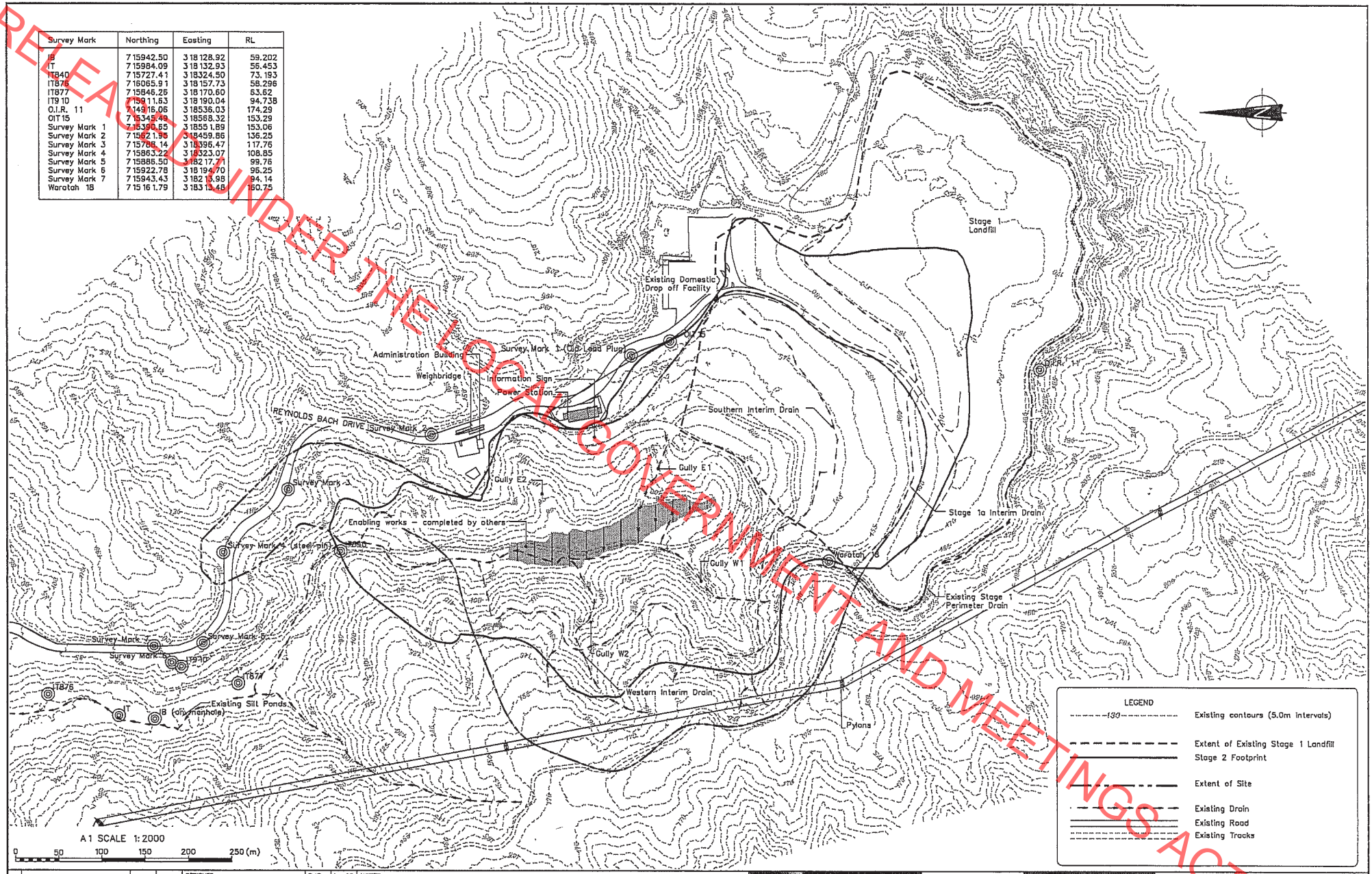
Survey Mark	Northing	Easting	RL
IB	7 15942.50	3 18 128.92	59.202
IT	7 15984.09	3 18 132.93	56.453
IT840	7 15727.41	3 18324.50	73.193
IT876	7 16065.91	3 18 157.73	58.296
IT877	7 15846.25	3 18 170.61	63.62
IT9 10	7 159 11.63	3 18 190.04	94.738
O.I.R. 11	7 149 16.06	3 18536.03	174.29
OIT15	7 15345.49	3 18568.32	153.29
Survey Mark 1	7 15390.65	3 1855 1.89	153.06
Survey Mark 2	7 15621.95	3 18459.86	136.25
Survey Mark 3	7 15786.14	3 18396.47	117.76
Survey Mark 4	7 15863.22	3 18323.07	108.85
Survey Mark 5	7 15886.50	3 182 17.71	99.76
Survey Mark 6	7 15922.78	3 18 194.70	96.25
Survey Mark 7	7 15943.43	3 182 13.98	94. 14
Waratah 18	7 15 16 1.79	3 183 13.46	160.75



REVISION DESCRIPTION	BY	DATE
A Tender Issue		

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NOTES :
1. All dimensions are in millimetres unless noted otherwise.
2. Coordinates:
Coordinate Datum: NZ Geodetic 1949 Wellington Circuit Coordinates
Origin: Mt Cook 700,000 mN 300,000 mE
Level Datum: LINZ (MSL).
3. Existing ground contours created from Airborne Laser Scanning data flown 2 August 2005. Data provided by AAMHATCH Pty Ltd, Reference: 2 10 11 190 1nob.

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SILVERSTREAM LANDFILL
SS2 Contract: AD 16 3624

TITLE
PHASE 1 BASE, SLOPES 1 & 2
Existing Survey Control

SCALES (AT A1 SIZE)	DWG. No.	REV.
1: 2000	8309 1.400-SET50 1	A

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Appendix E: Monitoring record sheets and trigger values

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SAMPLED BY:

DATE:

WEATHER:

SILVERSTREAM SURFACE WATER MONITORING

SW	TEST	COMMENTS	
1a	Temp	Clarity	Photo
	pH	Foam?	
	Cond	Odour?	
	DO	Algae?	
	SS	Flow	
	Turb	Ammonia test strip:	
2a	Temp	Clarity	Photo
	pH	Foam?	
	Cond	Odour?	
	DO	Algae?	
	SS	Flow	
	Turb	Ammonia test strip:	
3a	Temp	Clarity	Photo
	pH	Foam?	
	Cond	Odour?	
	DO	Algae?	
	SS	Flow	
	Turb	Ammonia test strip:	
4	Temp	Clarity	Photo
	pH	Foam?	
	Cond	Odour?	
	DO	Algae?	
	SS	Flow	
	Turb	Ammonia test strip:	

Silverstream Leachate	Leachate flow (from weir)	Comments (Clarity, foam)
Temp		
pH		
Cond		Leachate flow download
SS		
Every month	Bottle sample (Jan, Mar, May, Jul, Sep, Nov) COLLECT SEPTEMBER SAMPLE AFTER 10AM AND SUBMIT TO HILLS BY 4PM SAME DAY	

Silverstream Dam			
Water level in reservoir (m)		Photo of:	Note: Bellmouth RL 67.1m
Piezo 1		West outlet	
Piezo 2		East outlet	
Piezo 3		V-notch weir (at Hydro)	
		Valve	(dm)

Hulls Creek/Hutt River Visual Observation	
Clarity:	
Foam:	
Odour:	
Algae:	
Photo	

Note during field testing:	
pH – Less than 5.1 or Greater than 8 Cond – Greater than 300 µS/cm DO – Less than 5mg/L SS – Greater than 25 Turb – Greater than 50	In the event that one of the aspects to the left is noted on site, please contact one of the follwing people: s7(2)(a) on s7(2)(a) or s7(2)(a) on s7(2)(a)

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Silverstream - Shallow bore monitoring

Tonkin+Taylor

Stabilisation parameters (every 2L):
pH = +/- 0.1 unit
conductivity = +/- 3% (of the previous reading)
temperature = +/- 0.2 °C
Water should look pretty clear i.e. not brown/sedimenty

Sampled by:
Date:
Weather:
Recently had significant rain? Yes/No (circle one)

BH	Water Level	Litres purged (total)	Field reading	#1	#2	#3	#4	#5	#6	Comments (clarity, odour, foam, bore condition)
4s			pH Cond Turb DO Temp SS							
14s			pH Cond Turb DO Temp SS							
14d			pH Cond Turb DO Temp SS							
15s			pH Cond Turb DO Temp SS							
15d			pH Cond Turb DO Temp SS							
5			pH Cond Turb DO Temp SS							

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Silverstream - Deep bore monitoring

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Important: Please collect samples AFTER 10AM and submit these to Hill Laboratories no later than 4pm the same day

Stabilisation parameters (every 2L):
pH = +/- 0.1 unit
conductivity = +/- 3% (of the previous reading)
temperature = +/- 0.2 °C
Water should look pretty clear i.e. not brown/sedimenty

Sampled by:
Date:
Weather:
Stream flow (low/mod/high):
Recently had significant rain? Yes/No (circle one)

BH	Water Level	Litres purged	Field reading	#1	#2	#3	#4	#5	#6	Comments (clarity, odour, foam, bore condition)
7			pH Cond Turb DO Temp SS							
10			pH Cond Turb DO Temp SS							
11			pH Cond Turb DO Temp SS							
12			pH Cond Turb DO Temp SS							
13			pH Cond Turb DO Temp SS							

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Silverstream Landfill

Daily Monitoring Log

Month: **Year:**

Measured by:

Day	Conductivity				Stormwater V Notch	Appearance at SW4 N = none, SL = slight, M = moderate, H = high			
	SW1	SW2	SW3	SW4	Weir L/Sec	cloudy	algae	foam	odour
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
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30									
31									

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Appendix 1: WGN970164 [33376]

Silverstream Landill Stage 2 Ground Water Trigger Values

Analyte	Units	BH4S	BH14S	BH14D	BH15S	BH15D	BH5	Old GW guideline (Stage 1 consents)
pH	N/A	4.5-8.0 [1]	4.8-6.2 [2]	4.4-7.4 [2]	5.9-7.5 [2]	5.6-7.6 [2]	4.9-6.1 [1]	6.5-9.0
Conductivity	(µS/cm)	330 [1]	210 [2]	280 [2]	560 [2]	460 [2]	250 [1]	1500
DO	mg/L	1.5 [3]	1.8 [3]	1.9 [3]	1.7 [3]	1.9 [3]	2.1 [3]	N/A
TO Carbon	mg/L	3.4 [6]	11 [5]	1.9 [5]	6.1 [5]	0.88 [5]	0.79 [6]	N/A
Alkalinity	mg/L	53 [4]	31 [5]	55 [5]	159 [5]	124 [5]	32 [4]	N/A
Sulphate	mg/L	18 [4]	9.9 [5]	6.7 [5]	15 [5]	9.6 [5]	24 [4]	1000
DRP	mg/L	0.035 [6]	0.022 [5]	0.063 [5]	0.086 [5]	0.071 [5]	0.047 [6]	N/A
Chloride	mg/L	59 [1]	51 [2]	44 [2]	49 [2]	42 [2]	38 [1]	700
Sodium	mg/L	33 [4]	26 [5]	32 [5]	43 [5]	41 [5]	44 [4]	300
Potassium	mg/L	2.7 [4]	1.6 [5]	2.0 [5]	2.3 [5]	2.1 [5]	2.0 [4]	N/A
Calcium	mg/L	20 [4]	2.9 [5]	9.2 [5]	57 [5]	35 [5]	2.8 [4]	N/A
Magnesium	mg/L	7.1 [4]	3.9 [5]	5.0 [5]	6.8 [5]	7.7 [5]	5.6 [4]	N/A
Ammonia-N	mg/L	0.15 [1]	0.1 [2]	0.02 [2]	0.076 [2]	0.075 [2]	0.045 [1]	1.8
Nitrate	mg/L	3.7 [1]	0.84 [2]	1.1 [2]	0.11 [2]	0.15 [2]	0.04 [1]	30
Boron	mg/L	0.37 ^	0.37 ^	0.37 ^	0.37 ^	0.37 ^	0.37 ^	N/A
Zinc	mg/L	0.38 [1]	0.028 [2]	0.04 [2]	0.059 [2]	0.05 [2]	0.081 [1]	2
Silica	mg/L	30 [4]	47 [5]	39 [5]	89 [5]	61 [5]	43 [4]	N/A

Calculation periods

[1] Monthly data points between 12/04 to 12/09.
[2] Monthly data points between 02/07 to 12/09.
[3] Monthly data points between 01/08 to 12/09
[4] Thirteen data points between 11/97 to 09/09.
[5] Six data points between 04/07 to 09/09.
[6] Four data points between 04/08 to 09/09

Notes:

a) Trigger values have been calculated as the mean plus or minus 3 standard deviations as per Condition 9 in Consent WGN 040184 [23258].
b) Values that greatly exceeded the long term average, causing a large standard deviation and an unacceptably high trigger value, were not used in the calculations.
c) Trigger values are shown to 2 significant figures.
d) ^ No boron has been detected in groundwater wells to date. Therefore, a trigger value cannot be calculated. The ANZECC 2000 guideline (95%) has been selected instead.

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Schedule 29 - Erosion and Sediment Control Framework

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REPORT

Tonkin+Taylor

Silverstream Landfill Stage 2

Erosion and Sediment Control Framework

Prepared for

Hutt City Council | Te Kaunihera o Awa Kairangi

Prepared by

Tonkin & Taylor Ltd

Date information

March 2022

Job Number

82889.1000.v2

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Exceptional thinking together

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Document Control

Title: Silverstream Landfill Stage 2 - Erosion and Sediment Control Framework					
Date	**Version**	**Description**	**Prepared by:**	**Reviewed by:**	**Authorised by:**
2022	1	Draft issue for client review	M. Van Niekerk	E. Breese	E. Breese
Mar 2022	2	Final	M. Van Niekerk	E. Breese	E. Breese

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1 Introduction and purpose

This document has been prepared to provide information to assist the Operator to prepare an Erosion and Sediment Control Plan (ESCP) for Silverstream Landfill. The preparation of the ESCP is a contractual requirement as stated in Section 1.2.4 and Section 5 of the Operations Contract Specification.

The ESCP will assist in ensuring the landfill is operated in accordance with its resource consent conditions (see Section 1.9 of the Landfill Management Plan) and in particular the requirements of Section 107 of Resource Management Act.

The ESCP to be reviewed and updated annually, and the proposed revisions shall be forwarded to the Owner and Engineering Consultant for review and approval.

1.1 Receiving environment

The valley is drained by Tip Stream. Tip Stream joins Hulls Creek approximately 200 metres before Hull Creek enters the Hutt River at the upstream end of the Taita Gorge.

Tip Stream and Hulls creek are not classified as significant streams. Though the Hutt river is a significant stream.

Figure 1.1: Tip Stream immediately downstream of the retention pond.

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2 Management

The Silverstream Landfill Management Plan (LMP) Section 2.2 describes the parties and their associated responsibilities for the Silverstream Landfill in general. Table 2.1 depicts the specific responsibilities with regards to erosion and sediment controls. The ESCP needs to these requirements.

Table 2.1: Management roles

Activities	Landfill Operator	Engineering Consultant
Compilation and annual update of an ESCP	X	
Weekly inspection of ESC controls	X	
Maintain and ameliorate all ESC measure	X	
Install all ESC measures, as required and when instructed with an NTC	X	
Report to Owner monthly	X	
General Design of structural retention structures or permanent ESC measures		X
Inspect the ESC measure on site and identify improvements on behalf of the owner		X
Report to Owner on a 6 weekly basis after inspection		X
Report to Greater Wellington Regional Council		X

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3 Potential sources

The activities and areas that can potentially generate erosion and sediment have been identified in Table 3.1 below.

Table 3.1: Contaminant Sources

Source activities/areas	Comment
Cell preparation/ construction (including earthworks)	Establish appropriate Erosion and sediment controls (i.e. perimeter drains, grit traps/DEBs) to ensure treatment at source. If the area will not be used for 3 months it should be stabilised with polymers/hydroseeding, especially in winter.
Surfaced roadways - Main access roads, carpark areas, drop off area	Need to ensure that the tracking of material on roads is minimised, that roads are swept as required, slips promptly removed and drainage channels and sumps are maintained in good condition.
Unsurfaced roadways	Roads to be graded towards a roadside channel with check dams. Roads that will not be used for 3 months should be stabilised with polymers, especially in winter. Frequent spraying of water to suppress dust. Roads to be maintained and in good condition.
Working tip face/ filling area	Run off from these areas should be to the leachate system.
Un-stabilized intermediate cover	Intermediate covered areas should be water shedding and areas that will not be used for 3 months or more should be stabilised with hydroseeding, especially in winter.
Final capped landfill	To be maintained and ensure sufficient vegetation cover at all times. If there is scour, repair and install super silt fences to direct water as required.
Transfer station, greenwaste and hazardous waste drop off	Sweeping of transfer station every fortnight, frequency can increase when necessary. Ensure there is no obstructions in stormwater system (i.e. litter or soils). Green waste area to slope towards the DEB in the corner. Greenwaste to be collected monthly. Ensure there is no spills in the Hazardous waste drop off area. Grease traps and sumps to be cleaned and maintained frequently.
Weighbridge	Ensure any stormwater drains are cleared and in good working condition, spills are contained and remediated prior to enter SW system, and road surface is free from sediments by frequent sweeping.
Stockpiles	Runoff from un s stockpiles to be treated prior to discharge into the stormwater system. Stockpiles that will not be used for 3 months or more to be stabilised.
Borrow/Earthwork areas	Establish appropriate Erosion and sediment controls (i.e. perimeter drains, grit traps/DEBs) to ensure treatment at source.
Landslips	Clean-up and repair directly after identification. Ensure there is no residue in stormwater system and stabilise with hydroseeding.
Earth channels/drains	Cleanout sediment build-up and repair scour, if required line with geotextile. Drainage channels to be maintained and in good condition.
Stabilized slopes with poor vegetation cover	Repair areas with Hydroseeding.

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4 Control objectives and methods

The primary objective for Erosion and Sediment Control (ESC) is to avoid causing or accelerating erosion and the subsequent generation of sediment. Where the primary objective is not practical, the secondary objective is the effective and efficient treatment of sediment discharges and limiting the extent and duration of any erosion or sediment generation.

An Erosion and Sediment Control Plan for the Landfill should set out implementable sediment control measures, for the specific control areas of operations, seasonal (summertime) construction, and capping. The ESCP should emphasize the minimization and treatment at source approach and all the ESC methods should be based on the following principles to ensure there is minimal to no impact on the receiving environment:

- Minimise disturbance
- Staged construction
- Protect and stabilize steep slopes
- Protect the receiving environment
- Stabilise exposed areas promptly
- Install perimeter drain controls (as required)
- Install detention devices (as required)
- Assess and adjust measures (inspect, monitor, maintain)
- Adjust ESC plan

The appropriate ESC methods will depend on the site constraints and thus the landfill operator should ensure the best management practices are implemented for the site by referring to the Greater Wellington Regional Council Erosion and Sediment Control Guide for Land Disturbing Activities in the Wellington Region, February 2021 (GWRC ESC Guideline).

Table 4.1 below summarises the various ESC measures, objectives and associated methods that can be implemented at the landfill.

Table 4.1: Erosion and sediment control measures

Measure	Objective	Method	Reference
Slope stabilization	Prevent silt generation at source. Undertaken on: (a) temporarily unprotected soil surfaces before rain (b) completed slopes when work moves elsewhere (c) construction areas stabilized • (d) any area that will be left bare for more than two months. The area of un-vegetated daily cover is to be minimized.	• minimization of bare slopes • track rolling surfaces • tyre rolling surfaces • compaction • mulching • grass seeding	Section E1.0 and E3.0 of the GWRC ESC Guideline
Temporary coarse silt retention	Maximize capture of mobilized silt.	• super silt fences • temporary settlement ponds close to the source	Section F1.0 of the GWRC ESC Guideline

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Measure	Objective	Method	Reference
	• Suitable at or near source. Details to be per GWRC Erosion and Sediment Control (ESC) Guideline.	for primary particle settlement • grit trap • check dams • silt socks	
Cut off drains/channels	Reduce erosion potential. • Suitable near source, with small flows cut-off channels reduce distances that water travels before entering the stormwater system, thereby reducing surface flow erosion potential.	• appropriate sizing • appropriate spacing • appropriate falls	Section E2.0 of the GWRC ESC Guideline for full design requirements
Channel reinforcement/lining	Reduce erosion potential. • Suitable for steeper slopes for moderate flow velocities or volumes. Drains and stormwater channels may be lined to reduce erosion potential.	• rock • geotextile • concrete • grass (sides, not invert)	Section E2.0 of the GWRC ESC Guideline
Velocity controls	Minimize re-suspension of sediment. • Suitable for use in most channels and drains. High flow velocities have the potential to pick up previously deposited silt and re-suspend the silt into the flow. Interrupting the flow by velocity controls will dissipate energy, reduce re-suspension, and reduce the risk of new channel bed erosion.	• flatter grades • intermediate ponds • roughened surfaces • baffles • rocks • channel invert sumps • check dams	Section E2.7 of the GWRC ESC Guideline
Permanent silt retention	Flow balancing to maximize time on site. Suitable on low or flat ground between channels. Water is held on-site within ponds thereby providing greater time for sediment to settle before discharge from the site. • Details to be per GWRC Erosion and Sediment Control (ESC) Guidelines[1].	• Decanting earth bund (DEB) • Sediment retention pond	Section F1.1 and F1.2 of the GWRC ESC Guideline

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Measure	Objective	Method	Reference
Road surfacing	• Reduce the amount of silt picked up on truck tires.	• hard gravel • asphalt	Frequent sweeping/regrading Spray suppressants
Road maintenance	• Keep silt on-site and controlled, only where silt controls are in place.	• Washing • sweeping	
Water management/control	• Carry flows on flat and steeper slopes. By using properly lined systems, erosion potential is eliminated.	• diversion drains • contour drains • chutes • downspouts • culverts	Section E2.5 of the GWRC ESC Guideline
Dust control	• Manage dust emissions.	• Water suppression, primarily to be source water from retention pond. • Binders • Mulching • Polymers	Section G8.0 and G9.0 of the GWRC ESC Guidelines

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5 ESC Maintenance

5.1 Maintenance triggers levels

5.1.1 SRP outflow pH less than 6.

The ESCP must identify the actions that will be undertaken if pH at the outflow drops below 6, all practicable measures to increase pH or cease pond discharge should be undertaken.

ESCP should allow for GWRC and Engineering Consultant, to be notified immediately if the pond discharges cannot cease, and a pH exceedance is sustained for over 1 hour.

5.1.2 Turbidity and visual clarity

According to the consent (WGN040184 [36288]) discharge of stormwater from the retention pond shall not result in any of the following effects in Tip Stream at or beyond the boundary of the landfill property:

- The production of any conspicuous oil or grease films, scums or foams or floatable or suspended material.
- Any conspicuous change in colour or visual clarity.
- Any emissions of objectionable odour.

Once the Landfill Operator notice slightly coloured water at SW1, this should trigger an ESC walkover. Change in visual clarity of surface water is an indication that there might be ESC measures that require repairs or improvement. As soon as areas have been identified as source of contamination, it should be addressed immediately.

5.1.3 Conductivity

According to the Silverstream Landfill Management Plan, the landfill operator is required to measure conductivity daily at SW1, SW2, SW3 and SW4. If the conductivity reading is more than 500µS/cm, it is an indicator that leachate is entering the stormwater system through either scouring of the capping or a leachate breakout. This should trigger a site walkover to identify the source of leachate (ie. leachate breakout on side slope or improper ESC measure), once the source of contamination area has been identified, it should be addressed immediately.

5.2 Maintenance

Maintenance should be conducted progressively, sever erosion and sediment control issues should be addressed urgent and proactively to ensure there is no adverse impact to the environment. The weekly and 6 weekly inspections assist in identifying non-routine issues that require action. Table 5.1 identifies the most common maintenance triggers that should be covered in the ESCP. The table should only be considered as indicative.

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Table 5.1: ESC Maintenance

Control	Trigger	Action
Diversion drains	Debris in channel forcing water out of channel	Remove debris
	Scour along edges of cut off or break out	Widen cut off channel and extend armour
	Scour in channel	Place armour rock in cut off channel
	Scour at outlet	Place armour rock at outlet
Pipes	Any build-up of debris in flume or pipe inlet	Remove debris
	Scour at inlet	Protect inlet with geotextile overlain with armour
	Scour around outlet	Place armour to dissipate energy
DEBs/SRPs	More than 20% filled with sediment	Remove sediment
	Floating decant blocked or sunk	Empty pond and repair decant
	Scour at discharge point	Install concreted pipe exit or sandbag overflow point to provide erosion resistant surface
	Erosion of bund	Armour bund by either placement of geotextile or rock
	Insufficient capacity filling quickly	Consider if clean water catchments could be re-directed to reduce catchment area Enlarge trap or provide additional DEBs/ SRPs
	Not treating water properly	Consider flocking, Refer to Section 5.1
Super silt fence	Fence flapping in wind	Reattach fabric to guide wire and increase number of fabric locks. If required install additional waratahs
	Build-up of sediment greater than 150mm in depth resulting in straining structure	Remove sediment after each big rain event
	Large rocks distorting fence alignment	Remove rocks
	Bottom of silt fence not properly anchored	Dig fence into ground and use pegs to keep in position
	Under cutting of fence by concentrated flow	Identify options to avoid concentrated flow or replace with grit trap
	Silt fence broken off top wire	Install additional clips on top wire. In very windy locations a netting fence may be required to keep the silt fence in place
Road grit traps/drop out pits	More than 50% full of sediment	Remove sediment

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Control	Trigger	Action
Cleaning access road	Dirt and or soil visible on road	Brush road surfaces weekly
Water quality	Visual discoloured	Daily WQ visual inspection of Tip stream, if visually discoloured notify Engineering consultant
Clean-out check dams	Visible sediment present on upstream side of check dam	Clear after each rainfall event or as and when required
Stabilise soil	Visual erosion paths and loss of cover	Hydroseeding with a suitable grass seed mix and sowing rate from a reputable seed provider Engineer to preapprove

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6 Improvements

Inspections of the ESC measures should be undertaken to ensure that they are operating correctly and achieving the ESC objectives. The ESCP should address the measures to be implemented if measures are found not to be operating correctly, Table 6.1 identified possible improvements that can be implemented. This table should only be considered indicative.

Table 6.1 Possible Improvements

Treatment device	Problem	Options
Diversion drains	Source of sediment laden water, eroded, pooling of water	Line base of channel with geotextile or rock
		Regrade the channel to have a flatter slope
DEBs/SRPs	Poor operating performance	Reduce disturbed areas (stabilising as you go)
		Redirect clean water catchments to reduce catchment area
		Reduce catchment area by installing another DEB/SRP
		Increase capacity of the DEB/SRP
		Clean out the DEB/SRP
		Consider flocculation/coagulation
Retention pond	Poor operating performance	Consider flocculation/coagulation Clean out every five years (due summer 2025/2026)
Super silt fence	Poor performance, broken/torn	Replace with new section super silt fence
		Supplement with hay bale row or other additional control
Road grit traps/drop out pits	Poor performance	Reduce catchment area by installing another grit trap
		Reduce disturbed areas (stabilising as you go)
		Install supplementary measures downstream (treatment train)

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7 Chemical Treatment

Chemical Treatment of sediment laden water can be implemented at SRPs and DEBs within the landfill boundary to ensure it operate within the consent limits.

It is not expected that the ESC devices on site will currently require flocculation, however, in the event that flocculation is required, the ESCP should address flocculation.

Greater Wellington Regional Council Erosion and Sediment Control Guide for Land Disturbing Activities in the Wellington Region, Section F2.0 provide guidance on coagulation and flocculation treatment. This section below is in addition to the GWRC guideline, and should be implemented as required.

7.1 Polyaluminium Chloride (PAC)

Poly-aluminium chloride (PAC) is a common and low-cost coagulant, that is widely used for wastewater treatment. PAC has been used successfully on site, but other flocculants are widely available.

Flocculants may be used on either a continuous basis or as one off (batch dosing).

7.2 Floc Blocks

Floc Blocks are solid blocks of slow release flocculant which work by releasing into the water stream trace amounts of anionic polymer chain molecules which act to bind together stone, soil, clay and chalk fines so that they will settle out rapidly leaving clear water for disposal or re-use. Floc blocks have been successfully used on site.

7.3 Flocculation storage and spills

The ESCP should include measures for storage of flocculants and procedures if there is a spill.

The current procedure at the Landfill is if there is a spill of any flocculant chemical onto the ground it should be immediately contained using earth bunds to prevent it entering water. The spilt chemical should be recovered if possible and placed in polyethylene containers. In the event that spilt chemical cannot be recovered, it should be mixed with a volume of soil equal to at least ten times the volume of spilt chemical. This will effectively neutralise the chemical. The soil with which the chemical has been mixed should be buried a minimum of 0.5 metres below the ground surface in a spoil disposal area or taken off site to a landfill.

If there is a spill of larger volumes of flocculant chemicals into a DEB or SRP, discharge from the device to natural water should be stopped and the water will then be tested to determine the level of contamination.

In the highly unlikely event there is a spill of flocculant chemicals into flowing water:

- Notify the HCC and the Engineering Consultant that will in turn notify Greater Wellington Regional Council immediately;
- The volume of the spill should be recorded;
- If possible, the water and spilt chemical should be contained in a bund or pond until all the spilt chemical has been removed from the watercourse or treated; and
- If the chemical cannot be removed from the watercourse or effectively treated any downstream waters users should be identified and advised.

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Flocculation is not limited to the products set out above. Additional products and technologies may be investigated to implement instead of flocculation. Should a new product and technology be proposed, approval from HCC prior to implementing should be sought.

7.4 Retention Pond

The Landfills retention pond has been flocculated in the past in response to significant events. This action is seen as a contingency measure. The flocculation of the retention pond will require approval from the Engineering Consultants.

To assist in contingency planning indicative dosing rates for the retention pond have been calculated. The dose rate will vary based on site condition at that point in time (i.e. temperature, turbidity, and water volume), hence Table 7.1 only provides indicative dose rates.

Table 7.1: Retention pond PAC dosages from bench testing

Water level at bell-mouth (RL)	Volume of water (m^3)	Indicative PAC dose (L)
67.1	18,200	500
66.7	16,900	450
66.4	14,250	380
66.1	12,750	350
65.8	11,250	300
65.5	9,500	250
Level where water is split into two sections		
65.2	8,000	220
64.9	7,250	200
64.6	6,000	150
64.3	5,000	140
64.0	4,200	120
63.8	3,750	100

If flocculating the retention pond is to occur the following advice is offered:

- Pond decant valve shall be closed prior to flocking.
- Do not floc if the water level is 100 mm above bell-mouth.
- The inlet section is approx. 30% of the pond volume.
- It is critical that the pond pH should not be lower than 6.
- Record the following data for each flocking event:
  - Volume of pond,
  - pH and Turbidity before and after dosing,
  - Time of dosing, and
  - Temperature of water.
- When batch dosing, it is critical that the flocculant is distributed evenly across the surface of the pond. Previously this has been implemented with a high-pressure hose.
- If the pond is spilling into bell-mouth, do not apply flocculation within 10 m of the bell-mouth.

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- If the ponds pH is below 6, lime can be added to the pond to bring pH up to an acceptable level.

7.5 Flocculation monitoring

When applying floc to the retention pond, the contractors should take a baseline pH and turbidity prior to flocking. If no immediate turbidity improvement is noticed in 30 min, the pond pH can be tested again. In the event that the pH is above 6.5 additional floc can be added to achieve required treatment. It's to be noted that no more floc shall be added if pH is below 6.5 to ensure that no portion of pond is below a pH of 6.

Once dosed with PAC, the water in the sediment pond shall be visually inspected and tested for pH and turbidity at the following time intervals 2 hrs, 12 hrs and 24 hrs. If colour and visual clarity is considered to meet the expectations Consent WGN040184 [36288], and pH levels are within the trigger values described in Section 5.2.4 of the LMP, no further PAC shall be applied. The decant valve shall be opened and the pond allowed to discharge. All dosing information recorded to be shared with the Engineering Consultant.

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8 Dust

The ESCP shall also include a section on how dust on site will be managed, with the minimum dust control requirements described in Section 4.15 of the Landfill Management Plan. Section G8.0 and G9.0 of the Greater Wellington Regional Council Erosion and Sediment Control Guide for Land Disturbing Activities in the Wellington Region provide specific guidance to soil binders and dust control.

The dust section shall include the identification of areas where dust may be generated, the methods for avoiding or treating dust, the trigger for instigating dust management activities, location and sources of water for dust suppression and the keeping of records of dust management.

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9 Contingencies

The ESCP needs to cover contingency actions in the event of natural hazards, extreme climatic events or human error the contingency indicative actions identified may need to be enacted.

Rain events greater than a 1 in 20 year ARI, 60 min duration rainfall event (or equivalent rainfall intensity) should be defined as an extreme event for ESC purposes. Under these circumstances, treatment efficiencies are expected to be significantly reduced. Table 9.1 identifies examples of matters that should be covered ESCP. The table should only be considered as indicative.

Table 9.1: Summary of contingency actions

Cause	Effect	Contingency Action
Earthquake	Failure of DEBs/SRPs	Determine extent of loss of sediment, contain lost sediment with silt fences, direct water away from watercourses and damaged / disturbed control devices, repair or replace DEB/ SRP.
	Slope failure	Check failure, determine if slip poses threat to water quality. Remove material out of water course if necessary and install silt fence at the slip toe.
Extreme rainfall event	Failure of DEBs/SRPs	Determine extent of loss of sediment, contain lost sediment with silt fences, direct water away from watercourses and damaged / disturbed control devices, repair or replace SRP/ DEB.
	Scour on fill and cut faces	Re-direct water and repair slopes.
	Failure of silt fences	Repair or replace.
	Slope failure	Inspect failure. Determine if slip poses threat to water quality. Remove material out of water course if necessary and install silt fence at the slip toe.
Prolonged drought	Failure of stabilisation methods	Use straw mulch, hydroseed and or geo fabric to stabilise surfaces.
Human error	Failure of SRP/ DEB	Determine extent of loss of sediment, contain lost sediment with silt fences, direct water away from damaged/disturbed device, repair or replace SRP/ DEB.
Chemical Spill	Discharge to aquatic environment	Stop the spill, block path to avoid entry to any surface water, Notify the Engineering Consultants and after assessment remove contaminants to landfill.

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10 Audit, Inspection and Reporting

10.1 Inspections and monitoring

The ESCP will detail the inspections to be undertaken by Landfill Operator on a weekly basis. Any maintenance issues identified shall be recorded within the monthly report to the owner, this should also include the maintenance actions that have been completed during that month.

10.2 Reporting

The Landfill operator should compile a monthly report that should include the following:

- ESC items identified that require maintenance.
- ESC items addressed during the month.
- Progress status of all the items identified during the Engineering Consultants 6 weekly inspection. Including reasons for delays.
- Record of chemical treatment usage (Specifically: type of floc, pH, turbidity, temperature and water level).

10.3 Auditing

It should be noted that Engineering Consultant (as owner representative) may undertake regular audits to determine compliance with consent conditions and provide an inspection summary report setting out any required actions to aid with compliance.

Proposed changes that may potentially affect ESC design should be discussed at site inspections and meetings. Changes to the ESCP (if any) should be agreed on prior to implementing.

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11 Applicability

This document has been prepared for the exclusive use of our client Hutt City Council | Te Kaunihera o Awa Kairangi with respect to the particular brief given to us. It may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement.

Tonkin & Taylor Ltd

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§7(2)(a)	§7(2)(a)
Civil Engineer	Project Director

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