Appendix 4:	Preliminary Geotechnical Suitability Assessment by Tonkin and Taylor Ltd

REPORT

HUTT CITY COUNCIL

Preliminary Geotechnical Suitability Assessment

Kelso Grove, Kelson

Report prepared for:
HUTT CITY COUNCIL

Report prepared by:
TONKIN & TAYLOR LTD

Distribution:

HUTT CITY COUNCIL	3 copies
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February 2009

T&T Ref: 84009.004

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Executive summary

Tonkin and Taylor Ltd (T&T) has been engaged by Hutt City Council (HCC) to undertake an Urban Development and Planning Assessment for strategic sites in Hutt City. T&T has included a geotechnical assessment at each of these proposed sites to determine geotechnical constraints to residential development.

The table below summarises the findings of our geotechnical assessment for Kelso Grove, Kelson.

Geotechnical Summary Information

Site reference	*Potential areas of land suitable for residential development (m^2)	Typical soil profile	Foundation preparation required	Additional foundation preparation cost per lot**
Kelso Grove, **(Site 4)**	5000 (Refer A Fig 4)	0-1m variable fill over rock	Excavate fill and replace	$4,500
	2500 (Refer A/B Fig 4)	1-3m variable fill over rock	Timber piles driven to rock on 2m grid	$15,000
	11000 (Refer B Fig 4)	1-2m loose soil/fill on 35 degree slope	Upslope retaining wall	$18,000

* This is the most suitable land for residential development at each site, refer Table 1 for full breakdown of available areas.

** Foundation preparation costs for a 10x15m building platform on each lot. These are costs over and above the costs of standard NZS3604 type shallow foundations.

1 Introduction

1.1 General

Tonkin and Taylor Ltd (T&T) has been engaged by Hutt City Council (HCC) to undertake an Urban Development and Planning Assessment for strategic sites in Hutt City.

A key development consideration in this assessment is the potential geotechnical constraints on each site. T&T has undertaken an initial geotechnical investigation at each of the proposed sites.

This report summarises the findings of our geotechnical investigation for Kelso Grove, Kelson (Site 4). The conditions of our engagement are detailed in our proposal dated October 2008.

1.2 Scope of Work

The scope of work for the geotechnical assessment includes:

Desk top study

- Review of 1:50,000 geological map of the area and HCC historic aerial photographs.
- Liaison with service providers to determine if any services extend through the site.
- Liaison with greater Wellington Regional Council to check historic contamination records (SLUR register)

Site Investigation (refer figure 4 for investigation locations)

- Test Pitting
- Geological mapping

Analysis and reporting

- Review of all subsurface investigation results
- Preparation of factual summary report and zoning maps of foundation suitability.

2 Geotechnical Assessment, Kelso Grove (Site 4)

The soil profile and depth to rock is inferred from limited test pit investigations. It must be appreciated that the subsurface conditions could vary away from the test locations.

2.1 Site Description

Site 4 comprises a flat area of land with moderately steep (30 to 35 degree) slopes to the north and east that lead up to the site boundary. To the south of the flat grassed area are 25 to 30 degree slopes falling some way beyond the southern site boundary.

The site access is a relatively steep 20 to 25 degree driveway extending off Kelso Grove to the north.

The northern and southern slopes are vegetated but the flat area of the site is maintained as a playing field.

The extent of the proposed site (Site 4) is shown on Figure 4 attached.

2.2 Site Geology and Soil Profile

The geotechnical investigation at Site 4 comprised 14 test pits to a maximum of 5.0m depth. The location of test pits TP 1 to TP 14 are shown on Figure 4.

The flat central area of Site 4 generally comprised a variable depth (1 to over 5m) of uncontrolled fill over the steep contours of the underlying greywacke rock.

The fill comprised inter-bedded layers of silty gravel and sandy silt. There were some significant (300 to 400 mm) layers of partially decomposed organic material including timber and topsoil as well as debris and waste material including plastic and steel wire.

It is envisaged that the vegetated slopes to the north and east of the site generally comprise a variable thickness of natural colluvium material (slope wash deposits) over weathered rock. A review of historic aerial photographs indicates that there is likely to be some areas of loose fill that has been pushed out over these slopes.

2.3 Geotechnical Considerations

There is a potential for differential foundation settlement over all areas of filling. The fill has the potential for significant foundation settlement due to uneven decomposition of buried organics and consolidation under additional loading. The steep contours of the underlying rock will increase the potential for differential settlements.

Our investigations have not located natural ground over some areas of the site. Figure 4 shows the different areas of the site classified according to expected fill depth (and, therefore, foundation preparation requirements).

Suitable foundation remedial solutions for different fill depths are discussed in detail in section 4.3 above.

These foundation recommendations are inferred from limited test pits it must be appreciated that ground conditions could vary away from these investigation locations.

2.4 Site Geotechnical Summary Information

Table 1: Summary information for Site 1, Kelso Grove

Geotechnical suitability classification (refer figure 4)	Approximate total area available (m^2)	Typical soil profile	Most appropriate remedial solution	Additional foundation preparation cost per lot*
A	5,000	Up to 1m fill material over weathered rock	Cut and remove unsuitable fill. Backfill with imported granular hardfill.	$4,500
A/B	2,500	1-3m fill over	Driven timber piles	$15,000

		weathered rock	extending to rock. Piles on 2x2m grid (48 no. 4.5m long piles, 200m total length for each lot).	
B	11,000	1-2m colluvium material (on a 30 to 35 degree slope) over weathered rock	Construct 3m high 15m long retaining wall on upslope side of each building platform.	$18,000
C	17,000 **	+6m fill with exterior areas of fill platform at risk of land instability	Excavate 3m depth of fill and replace with geogrid reinforced hardfill raft (450m^3 earthworks with 300m^2 geogrid for each lot).	$47,000

*Foundation preparation costs for a 10x15m building platform on each lot. These are costs over and above the costs of standard NZS3604 type shallow foundations.

3 Applicability

This report has been prepared for the benefit of 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 without our prior review and agreement.

TONKIN & TAYLOR LTD

Environmental and Engineering Consultants

Report prepared by:

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Andrew Kennedy

Geotechnical Engineer

Authorised for Tonkin & Taylor by:

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Bruce Symmans

Senior Geotechnical Engineer

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Appendix A: Test Pit Logs

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EXCAVATION LOG

EXCAVATION NO: TP1
SHEET 1 OF 1

PROJECT: Hutt City Plan-Geotech Investigation. LOCATION: Kelso Grove, Kelson JOB NO: 84009.004

CO-ORDINATES:

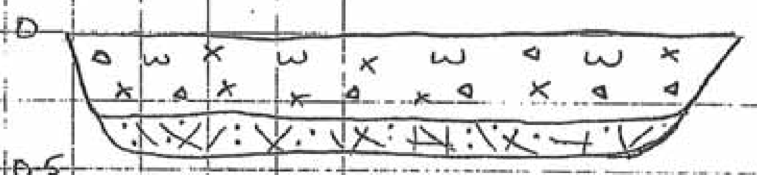
EXPOSURE TYPE: Test Pit.
EQUIPMENT: 12t excavator
OPERATOR: Bellamys
EXCAVATION DIMENSIONS: Dug to intercept natural ground

HOLE STARTED: 2/12/08
HOLE FINISHED: 2/12/08
LOGGED BY: CWP
CHECKED BY:

RL:
DATUM:

EXCAVATION AND TESTS:					ENGINEERING DESCRIPTION:						GEOLOGICAL:	
PENETRATION 2 3	SUPPORT	WATER	SAMPLES, TESTS	RL (m) DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	SOIL NAME, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, SECONDARY AND MINOR COMPONENTS	MOISTURE CONDITION	SHEAR STRENGTH OR RELATIVE DENSITY	ESTIMATED SHEAR STRENGTH, kPa	ORIGIN TYPE, MINERAL COMPOSITION, DEFECTS, STRUCTURE	UNIT
	N/A	NOT SEEN		0		OL/OH	SILT some Gravel. low plasticity. subrounded, fine to coarse gravels, Brown, organics.	M	F		Topsoil-poorly developed.	
							Sandstone. Orange Brown. Iron & Manganese stained. Very Weak. Closely spaced defects	M	VW		MW-HW Sandstone Bed-rock.	
				0.5			Test pit terminated due to interception with rock.					

SKETCH



TONKIN & TAYLOR LTD.

EXCAVATION LOG

EXCAVATION NO: TP 2
SHEET 1 OF 1

PROJECT: Hutt City Plan-Geotech Investigation	LOCATION: Kelso Grove, Kelson	JOB NO: 84009.004
CO-ORDINATES:	EXPOSURE TYPE: test pit	HOLE STARTED: 2/12/08
	EQUIPMENT: 12t excavator	HOLE FINISHED: 2/12/08
RL:	OPERATOR: Bellamys	LOGGED BY: CWP
DATUM:	EXCAVATION DIMENSIONS: Dug to intercept natural ground.	CHECKED BY:

PENETRATION 1 2 3	SUPPORT	WATER	SAMPLES, TESTS pp = poket penetrometer	RL (m) DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	SOIL NAME, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, SECONDARY AND MINOR COMPONENTS	MOISTURE CONDITION	SHEAR STRENGTH OR RELATIVE DENSITY	ESTIMATED SHEAR STRENGTH, kPa	ORIGIN TYPE, MINERAL COMPOSITION, DEFECTS, STRUCTURE	UNIT
	N/A	NOT SEEN	PP=125kPa	0		OL & GM	SILT, some gravel. low plasticity. Fine to cobble sized gravel. Brown. Organics.	M	VS		Fill	
				0.5			Gravelly SILT. Mod plasticity. Fine to coarse, subrounded gravels. Green with orange staining.					
			PP=100kPa	1.0		OL/OH	Organic rich - twigs, poorly decomposed.	M	S-VS		Buried topsoil	
							Sandstone. Orange brown, Fine, iron & manganese stained, closely spaced defects.	M	VW		HW - MW Sandstone Bedrock.	
				1.5			Test pit terminated due to interception with rock					

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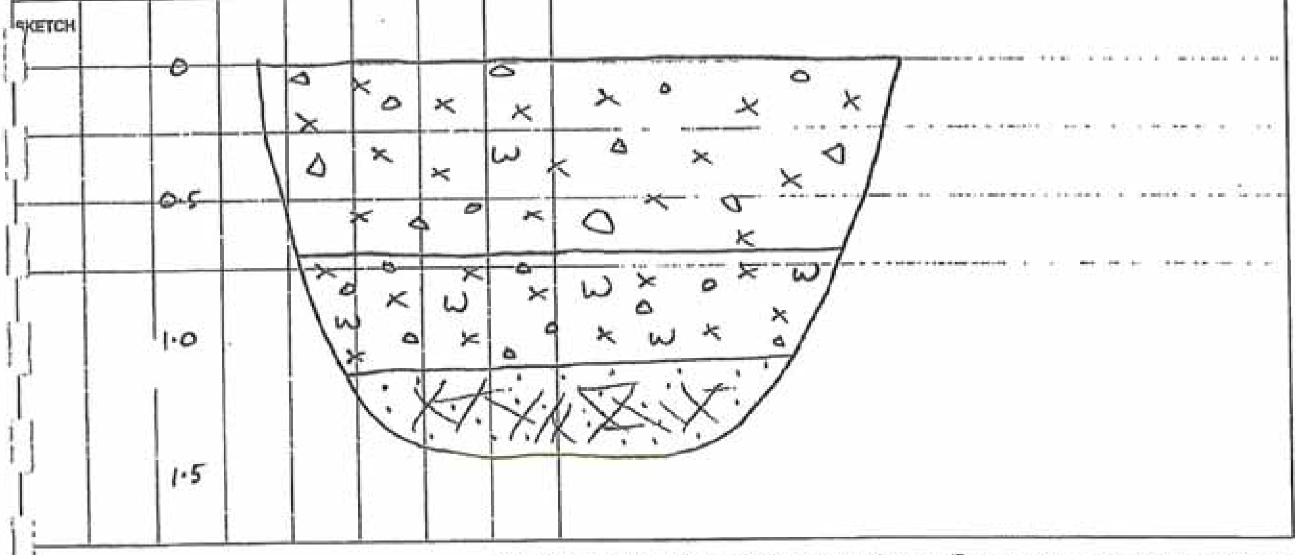

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EXCAVATION LOG

EXCAVATION NO: TP 3
SHEET 1 OF 1

PROJECT: Hutt city plan - Geotech Investigation LOCATION: Kelso Grove, Kelson JOB NO: 84009.004
CO-ORDINATES: EXPOSURE TYPE: Test pit HOLE STARTED: 2/12/08
EQUIPMENT: 12t excavator HOLE FINISHED: 2/12/08
RL: OPERATOR: Bellamys LOGGED BY: CWP
DATUM: EXCAVATION DIMENSIONS: Dug to intercept natural ground CHECKED BY:

EXCAVATION AND TESTS:					ENGINEERING DESCRIPTION:						GEOLOGICAL:	
PENETRATION 1 2 3	SUPPORT	WATER	SAMPLES, TESTS	RL (m) DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	SOIL NAME, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, SECONDARY AND MINOR COMPONENTS	MOISTURE CONDITION	SHEAR STRENGTH OR RELATIVE DENSITY	ESTIMATED SHEAR STRENGTH, kPa	ORIGIN TYPE, MINERAL COMPOSITION, DEFECTS, STRUCTURE	UNIT
	N/A	NOT SEEN	pp=150kPa pp=225kPa	0		OL/OH	Sandy SILT, some Gravel. Mod plasticity. Green/Brown. Fine to coarse, subangular gravels. Organic rich.	W	fb		Topsoil - Dessication cracking.	
				1.0		GM	Silty GRAVEL. Fine to coarse, subangular, brown.	M			Fill	
			pp=75kPa	2.0		OL ↓ GM	Sandy SILT with Gravel. Moderate plasticity. Green. Typically fine to medium sized, angular gravels. Organics - sticks, twigs. Some more gravelly material encountered with depth.	M	S		Fill	
				3.0								
				4.0								
				5.0			Test pit terminated at limit of excavator reach.					

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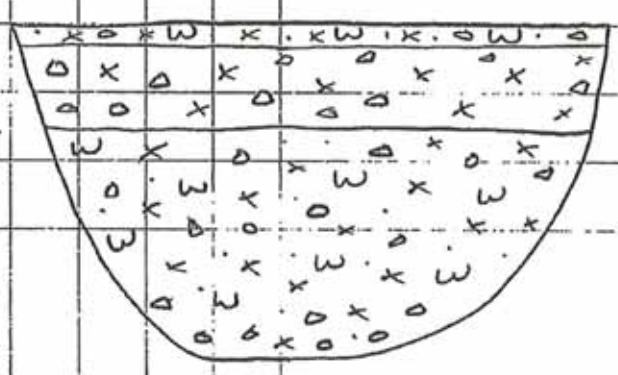

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EXCAVATION LOG

EXCAVATION NO: TP 4
SHEET 1 OF 1

PROJECT: Hutt City Plan-Geotech Investigation
LOCATION: Kelso Grove, Kelson
JOB NO: 84009.004
CO-ORDINATES:
EXPOSURE TYPE: Test Pit
HOLE STARTED: 2/12/08
EQUIPMENT: 12t excavator
HOLE FINISHED: 2/12/08
OPERATOR: Bellamys
LOGGED BY: CWP
RL:
DATUM:
EXCAVATION DIMENSIONS: Dug until interception with natural ground.
CHECKED BY:

EXCAVATION AND TESTS:				ENGINEERING DESCRIPTION:						GEOLOGICAL:	
PENETRATION 1 2 3	SUPPORT	WATER	SAMPLES, TESTS	RL (m) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	SOIL NAME, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, SECONDARY AND MINOR COMPONENTS	MOISTURE CONDITION	SHEAR STRENGTH OR RELATIVE DENSITY	ESTIMATED SHEAR STRENGTH, kPa	ORIGIN TYPE, MINERAL COMPOSITION, DEFECTS, STRUCTURE	UNIT
	N/A	NOT SEEN	pp=150kPa pp=200kPa	0		ML	Sandy SILT with Gravel. low to Mod plasticity. Orange Brown. Typically fine to med gravels. Sub angular.	M	St		Fill	
				1.0		GM	Silty GRAVEL with Sand. Typically fine to medium. some coarse to cobble sized. Sub angular. Brownish Green. Organic Rich - sticks, branches.	M			Fill	
				2.0			SILT & Organics. Plastic. Dark Brown. Layers of branches/logs. Poorly decomposed.					
				3.0		OL/OH	SILT, some Sand & Gravel. Mod plastic. Gravels are green in brown silt matrix. Some organics.	M			Fill - Almost entirely organics.	
				4.0		OL/OH		M	VS		Possible buried topsoil	
				5.0			Test pit terminated at limit of excavator reach.					

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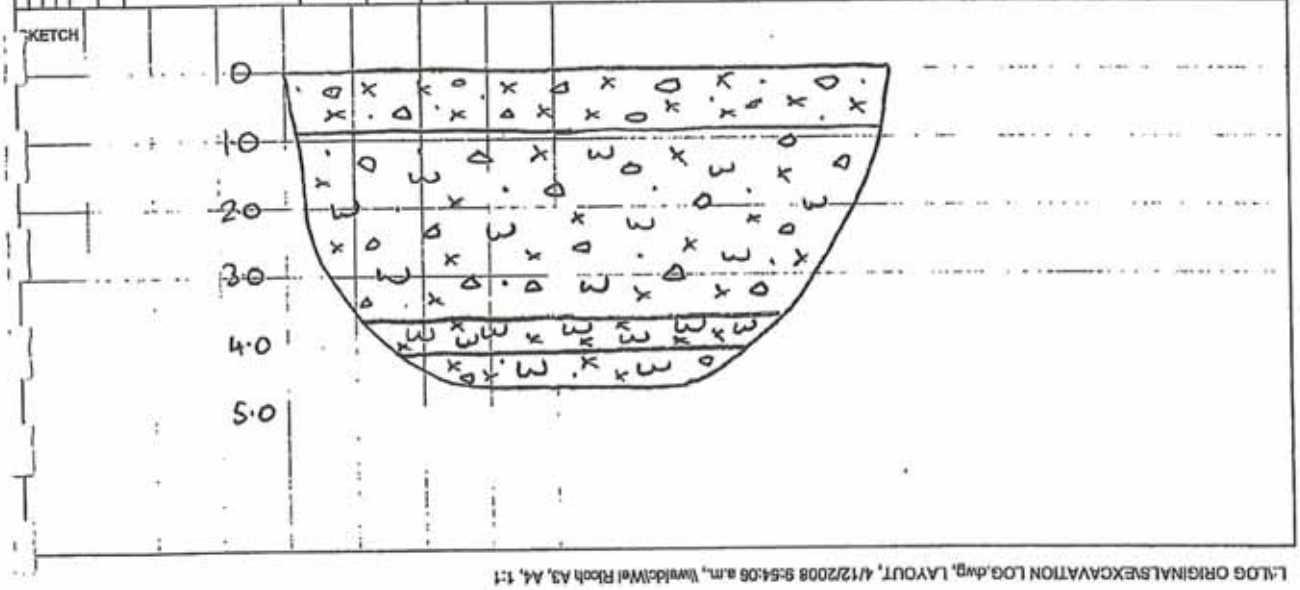

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EXCAVATION LOG

EXCAVATION NO: TP5
SHEET 1 OF 1

PROJECT: Hutt City Plan - Geotech Investigation. LOCATION: Kelco Grove, Kelson JOB NO: 84009-004
CO-ORDINATES: EXPOSURE TYPE: test pit HOLE STARTED: 2/12/08
EQUIPMENT: 12t excavator HOLE FINISHED: 2/12/08
RL: OPERATOR: Bellamys LOGGED BY: CWP
DATUM: EXCAVATION DIMENSIONS: dug until interception with natural ground. CHECKED BY:

EXCAVATION AND TESTS:				ENGINEERING DESCRIPTION:						GEOLOGICAL:	
PENETRATION 2 3	SUPPORT	WATER	SAMPLES, TESTS	RL (m) DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	SOIL NAME, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, SECONDARY AND MINOR COMPONENTS	MOISTURE CONDITION	SHEAR STRENGTH OR RELATIVE DENSITY	ESTIMATED SHEAR STRENGTH, kPa	ORIGIN TYPE, MINERAL COMPOSITION, DEFECTS, STRUCTURE	UNIT
	N/A	NOT SEEN	pp=150kPa pp=UTP	0		GM	Sandy GRAVEL with Silt. Fine to cobble sized, angular to sub angular. Brown	M			Fill	
			pp= 75kPa pp=125kPa	1.0		OL/OH	Sandy SILT with Gravel. low to Moderate plasticity. Green + Dark brown organics. Clay rich pockets. >5% organics.	M	St to VSt		Buried Topsoil	
				2.0			Silty SAND low Plasticity. Light yellow/ Brown. Black Flecks. Grades to GRAVEL/Sandstone Rock.	M	EW ↓ VW		CW Sandstone Bedrock Grading to HW.	
				3.0								
				4.0			Test pit terminated due to interception with natural ground.					

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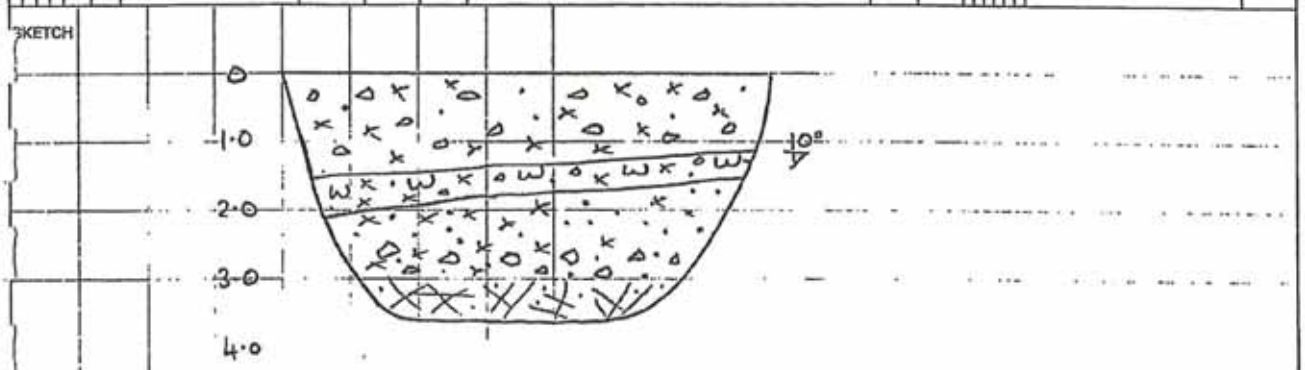

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EXCAVATION LOG

EXCAVATION NO: TP 6
SHEET 1 OF 1

PROJECT: Hutt city plan - Geotech Investigation.
LOCATION: Kelso Grove, Kelson
JOB NO: 84009.004
CO-ORDINATES:
RL:
DATUM:
EXPOSURE TYPE: test pit
EQUIPMENT: 12t excavator
OPERATOR: Bellamys
EXCAVATION DIMENSIONS: Dug until interception with natural ground.
HOLE STARTED: 2/12/08
HOLE FINISHED: 2/12/08
LOGGED BY: CWP
CHECKED BY:

EXCAVATION AND TESTS:				ENGINEERING DESCRIPTION:						GEOLOGICAL:	
PENETRATION 2 3	SUPPORT	WATER	SAMPLES, TESTS	RL (m) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	SOIL NAME, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, SECONDARY AND MINOR COMPONENTS	MOISTURE CONDITION	SHEAR STRENGTH OR RELATIVE DENSITY	ESTIMATED SHEAR STRENGTH, kPa	ORIGIN TYPE, MINERAL COMPOSITION, DEFECTS, STRUCTURE	UNIT
	N/A	NOT SEEN	pp = 63kPa pp = 125kPa	0		GM	Silty GRAVEL with Sand. Coarse to fine, angular to sub angular. Orange Brown	M			Fill	
			pp = 38kPa pp = 63kPa pp = 25kPa	1.0		OL ↓ GM	Gravelly SILT Mod plasticity. Green. Coarse to fine, sub angular gravel. Organic rich - branches, twigs. Layers of more gravel rich (silty GRAVELLY) material some of which is orange brown.	M	S/F/St		Fill layers	
				3.0		OL/OH	SILT Some Gravel Mod plasticity. Dark brown. Fine gravels, rich in organics.					
				4.0		OL/OH	Sandy SILT low plasticity. Orange/light yellow.	M	F/St		Buried Topsoil	
			pp = 160kPa			ML		M	EW		Residual bedrock	
				5.0			Test pit terminated due to interception with natural material.					

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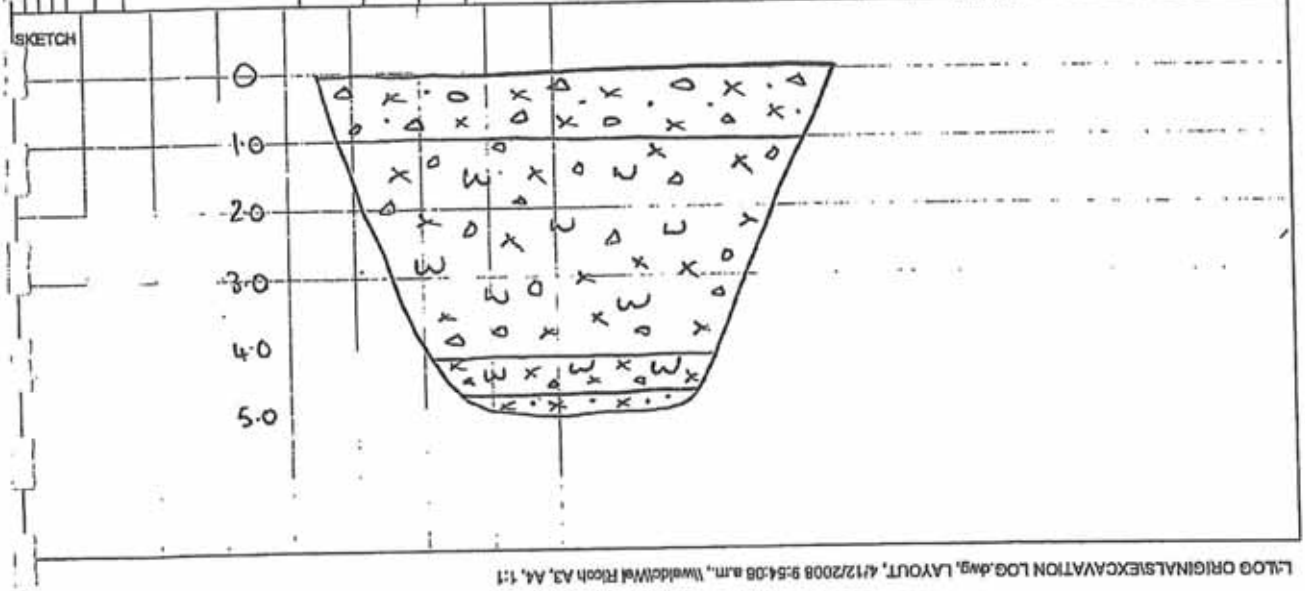

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EXCAVATION LOG

EXCAVATION NO: TP 7
SHEET 1 OF 1

PROJECT: Hutt city plan-Geotech LOCATION: Kelso Grove, Kelson JOB NO: 54009.004
CO-ORDINATES: Investigation EXPOSURE TYPE: test pit HOLE STARTED: 2/12/08
EQUIPMENT: 12t excavator HOLE FINISHED: 2/12/08
RL: OPERATOR: Bellamys LOGGED BY: CWP
DATUM: EXCAVATION DIMENSIONS: Dug until interception with natural ground. CHECKED BY:

EXCAVATION AND TESTS:					ENGINEERING DESCRIPTION:					GEOLOGICAL:	
PENETRATION 2 3	SUPPORT	WATER	SAMPLES, TESTS	RL (m) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	SOIL NAME, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, SECONDARY AND MINOR COMPONENTS	MOISTURE CONDITION	SHEAR STRENGTH OR RELATIVE DENSITY	ESTIMATED SHEAR STRENGTH, kPa	ORIGIN TYPE, MINERAL COMPOSITION, DEFECTS, STRUCTURE	UNIT
	N/A	NOT SEEN	pp=UTP	0		GM	Silty GRAVEL some Sand. Coarse to fine, sub angular. Orange Brown.	M			Fill	
				1		GM/ OL/ OH	Silty GRAVEL Typically fine to medium sized, sub rounded to sub angular. Green. Rich organic content and clay pockets.	M			Fill	
				2								
				3			SILT Grading to Sandy GRAVEL Orange Brown. Low plasticity.	M			CW grading to HW basement rock.	
				4								
				5			Test pit terminated due to interception with natural materials.					

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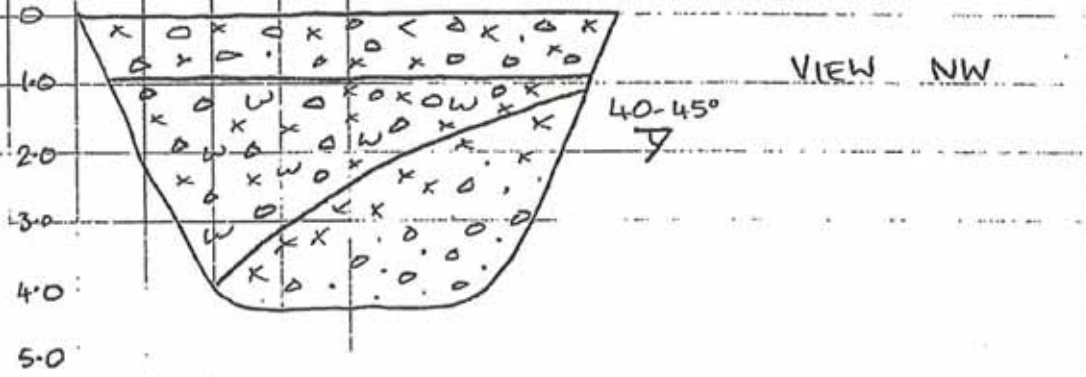

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EXCAVATION LOG

EXCAVATION NO: TP 8
SHEET 1 OF 1

PROJECT: Hutt city plan - Geotech Investigation
LOCATION: Kelso Grove, Kelson
JOB NO: 84009.004
CO-ORDINATES:
EXPOSURE TYPE: test pit
HOLE STARTED: 2/12/08
EQUIPMENT: 12t excavator
HOLE FINISHED: 2/12/08
OPERATOR: Bellamys
LOGGED BY: CWP
RL:
DATUM:
EXCAVATION DIMENSIONS: Dug until interception with natural material
CHECKED BY:

EXCAVATION AND TESTS:				ENGINEERING DESCRIPTION:						GEOLOGICAL:	
PENETRATION 2 3	SUPPORT	WATER	SAMPLES, TESTS	RL (m) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	SOIL NAME, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, SECONDARY AND MINOR COMPONENTS	MOISTURE CONDITION	SHEAR STRENGTH OR RELATIVE DENSITY / ESTIMATED SHEAR STRENGTH, kPa	ORIGIN TYPE, MINERAL COMPOSITION, DEFECTS, STRUCTURE	UNIT
	N/A	NOT SEEN		0							
			pp=38kPa			GM	Silty GRAVEL with Sand. Fine to coarse, angular to subangular. Orange/Brown Organics.	M		Fill	
			pp=63kPa	1.0		GM	Silty GRAVEL with Sand. Fine to coarse, angular to subangular. Green. Some orange/brown material. Organics	M		Fill	
			pp=88kPa	2.0							
			pp=50kPa	3.0		OL/OH	Gravelly SILT low to Mod plasticity. Dark brown. Organic clay rich. Sticks, bark, steel cable.	M		Fill	
				4.0							
				5.0			Test pit terminated at limit of excavator reach.				

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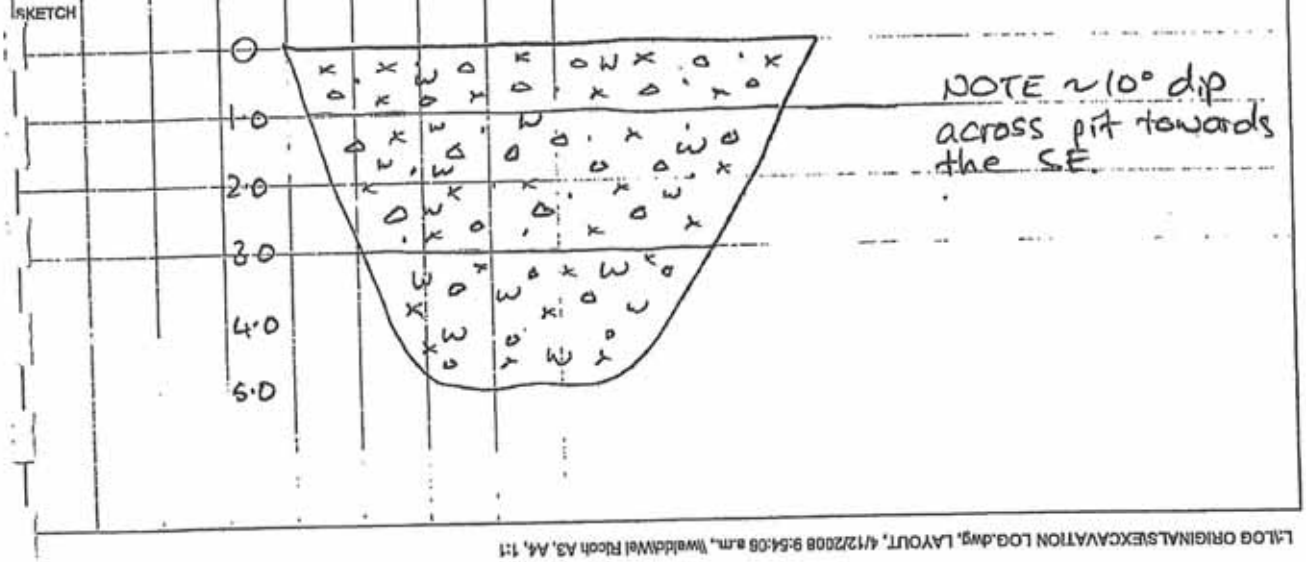

NOTE ~10° dip across pit towards the SE.

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EXCAVATION LOG

EXCAVATION NO: TP 9
SHEET 1 OF 1

PROJECT: Hutt City Plan-Geotech investigation LOCATION: Kelso Grove, Kelson JOB NO: 84009-004
CO-ORDINATES: EXPOSURE TYPE: test pit HOLE STARTED: 2/12/2008
EQUIPMENT: 12t excavator HOLE FINISHED: 2/12/08
RL: OPERATOR: Bellamys LOGGED BY: CWP
DATUM: EXCAVATION DIMENSIONS: Dug until interception with natural materials CHECKED BY:

EXCAVATION AND TESTS:					ENGINEERING DESCRIPTION:						GEOLOGICAL:	
PENETRATION 1 2 3	SUPPORT	WATER	SAMPLES, TESTS	RL (m) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	SOIL NAME, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, SECONDARY AND MINOR COMPONENTS	MOISTURE CONDITION	SHEAR STRENGTH OR RELATIVE DENSITY	ESTIMATED SHEAR STRENGTH, kPa	ORIGIN TYPE, MINERAL COMPOSITION, DEFECTS, STRUCTURE	UNIT
	N/A	NOT SEEN		0		GM	Silty GRAVEL with Sand. Fine to coarse gravels, angular to subangular. Brown.	M			Fill	
				1		OL/OH	Gravelly SILT some sand. Moderate plasticity. Green/dark brown. Organic rich. Pockets of organic clays.	M			Fill	
				2								
				3								
				4								
				5			Test pit terminated at limit of excavator reach					

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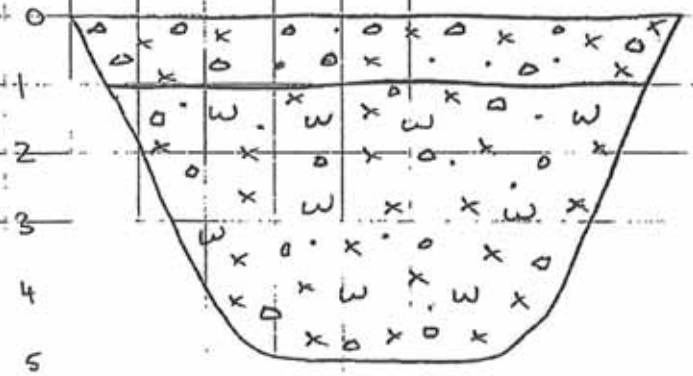

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TONKIN & TAYLOR LTD.

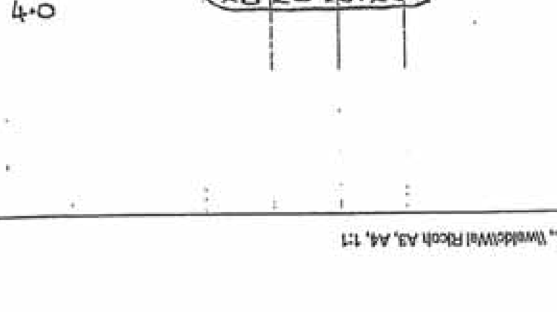
EXCAVATION LOG

EXCAVATION NO: TP10
SHEET 1 OF 1

PROJECT: Hutt City Plan-Geotech LOCATION: Kelso Grove, Kelson JOB NO: 81009.004
CO-ORDINATES: Investigation. EXPOSURE TYPE: HOLE STARTED:
EQUIPMENT: HOLE FINISHED:
RL: OPERATOR: LOGGED BY:
DATUM: EXCAVATION DIMENSIONS: CHECKED BY:

Depth (m)	Support	Water	Classification Symbol	Soil name, plasticity or particle size characteristics, colour, secondary and minor components	Moisture condition	Shear strength or relative density	Geological: origin type, mineral composition, defects, structure
0 – 1.0	N/A	NOT SEEN	GM	Silty GRAVEL with Sand. Fine to coarse gravels, sub angular. Orange/Brown.	M		Fill
1.0 – 3.0			OL/OH	Gravelly SILT, some Sand. Mod plasticity. Green/dark brown. Organic rich. Some clay rich layers.	M		Fill
3.0 – 4.0			GM	Silty GRAVEL, some Sand. Fine to coarse, angular, Orange/brown, stained. Weak gravels.	M	W	HW bedrock
4.0				Test pit terminated due to interception with natural material			

SKETCH



TONKIN & TAYLOR LTD.

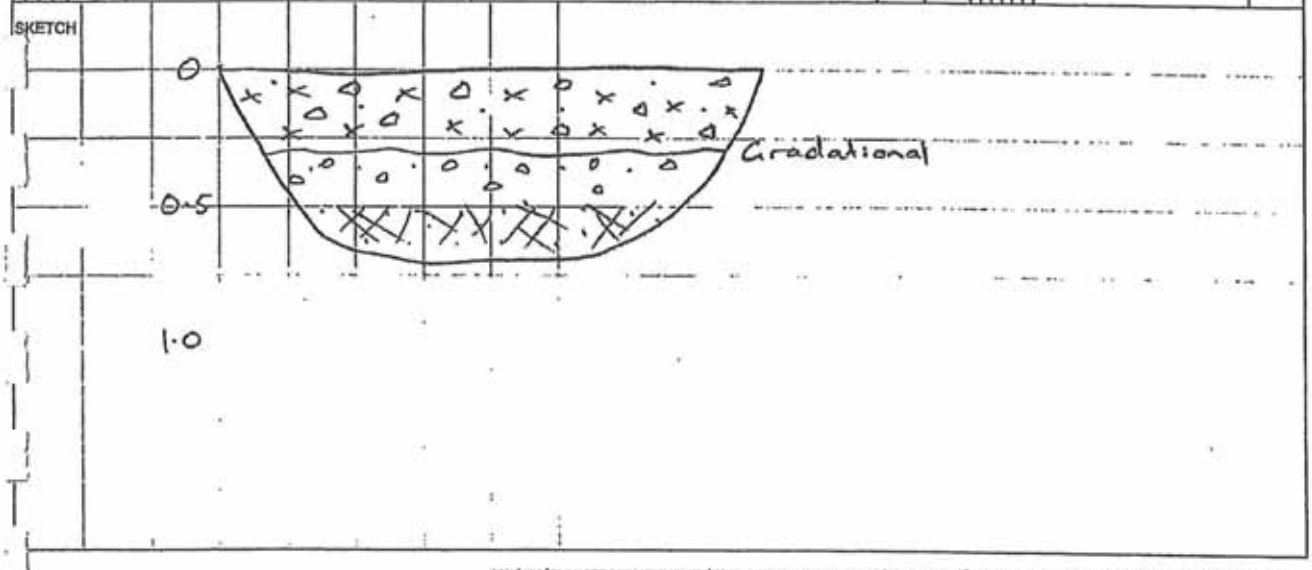
EXCAVATION LOG

EXCAVATION NO: TP11
SHEET 1 OF 1

PROJECT: Hutt City Plan-Geotech Investigation. LOCATION: Kelso Grove, Kelson JOB NO: 84009.006
CO-ORDINATES: EXPOSURE TYPE: HOLE STARTED:
EQUIPMENT: HOLE FINISHED:
RL: OPERATOR: LOGGED BY:
DATUM: EXCAVATION DIMENSIONS: CHECKED BY:

EXCAVATION AND TESTS:					ENGINEERING DESCRIPTION:						GEOLOGICAL:	
PENETRATION 1 2 3	SUPPORT	WATER	SAMPLES, TESTS	RL (m) DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	SOIL NAME, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, SECONDARY AND MINOR COMPONENTS	MOISTURE CONDITION	SHEAR STRENGTH OR RELATIVE DENSITY	ESTIMATED SHEAR STRENGTH, kPa	ORIGIN TYPE, MINERAL COMPOSITION, DEFECTS, STRUCTURE	UNIT
	N/A	NOT SEEN		0		OL	Gravelly SILT. Some Sand Low plasticity. Brown. Organic rich.	M			Topsoil - Poorly developed	
				0.5		GM	Sandy Gravel/HW Sandstone rock. Orange brown. Iron & manganese stained. Closely spaced fractures.	M	W/VW		HW bedrock.	
				1.0			Test pit terminated due to interception with natural material.					

SKETCH



TONKIN & TAYLOR LTD.

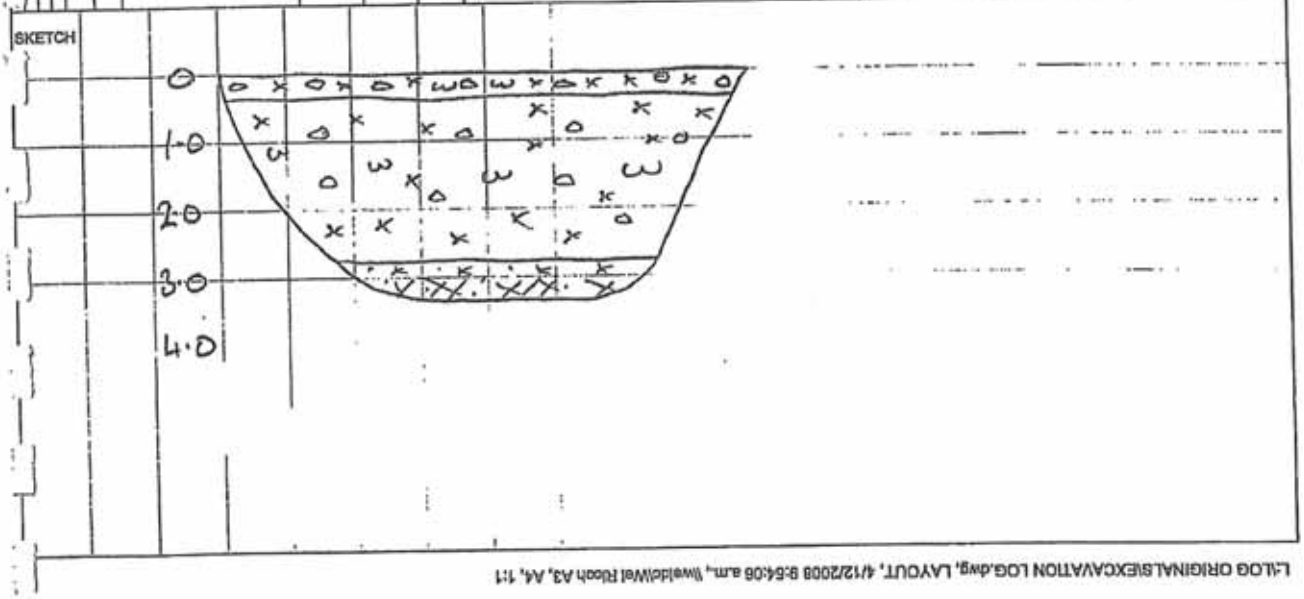
EXCAVATION LOG

EXCAVATION NO: TP12
SHEET 1 OF 1

PROJECT: Hutt City Plan-Geotech Investigation. LOCATION: Kelso Grove, Kelson JOB NO: 845009.002
CO-ORDINATES: EXPOSURE TYPE: HOLE STARTED:
EQUIPMENT: HOLE FINISHED:
RL: OPERATOR: LOGGED BY:
DATUM: EXCAVATION DIMENSIONS: CHECKED BY:

EXCAVATION AND TESTS:				ENGINEERING DESCRIPTION:						GEOLOGICAL:	
PENETRATION 2 3	SUPPORT	WATER	SAMPLES, TESTS	RL (m) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	SOIL NAME, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, SECONDARY AND MINOR COMPONENTS	MOISTURE CONDITION	SHEAR STRENGTH OR RELATIVE DENSITY	ESTIMATED SHEAR STRENGTH, kPa	ORIGIN TYPE, MINERAL COMPOSITION, DEFECTS, STRUCTURE	UNIT
	N/A	NOT SEEN		0		OL	Gravelly SILT low plasticity. Brown. Organic material.	M			Fill	
				1.0		OL/OH	Gravelly SILT Mod plasticity. Green/ Dark brown. Organic rich.	M			Fill	
				2.0			SILT grading to HW Sandstone rock. Iron stained. Closely spaced fractures.	M	W/EW		CW → HW bedrock	
				3.0			Test pit terminated due to interception with natural materials					
				4.0								

SKETCH



TONKIN & TAYLOR LTD.

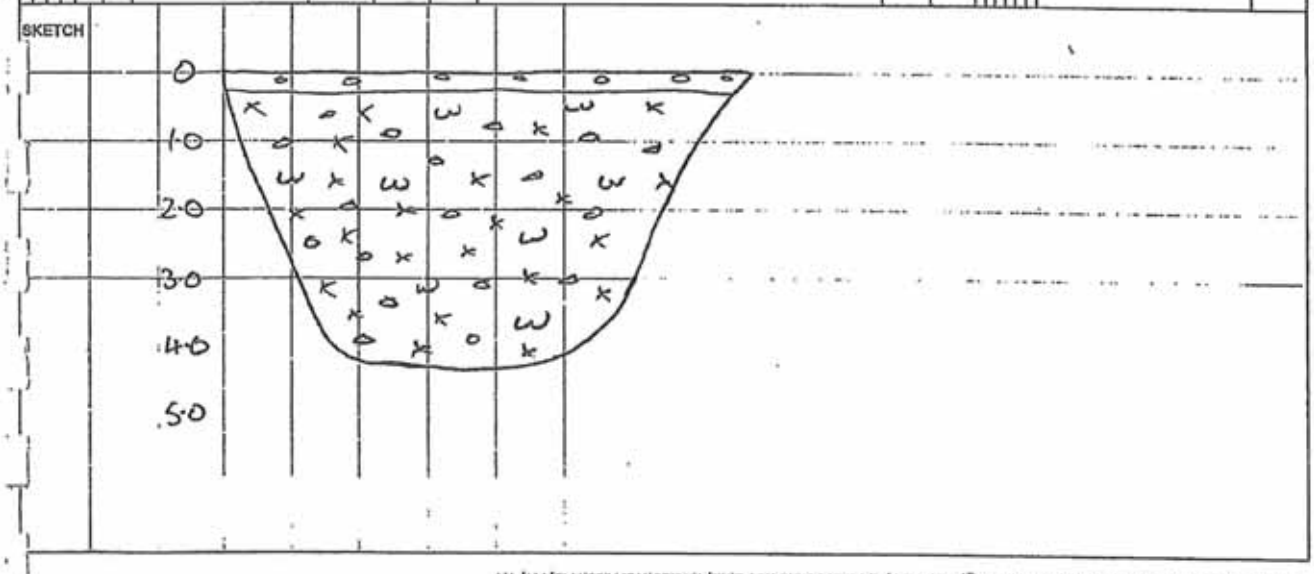
EXCAVATION LOG

EXCAVATION NO: TP13
SHEET 1 OF 1

PROJECT: Hutt City Plan-Geotech Investigation | LOCATION: Kelso Grove, Kelson | JOB NO: 84009.004
CO-ORDINATES: | EXPOSURE TYPE: | HOLE STARTED:
EQUIPMENT: | HOLE FINISHED:
RL: | OPERATOR: | LOGGED BY:
DATUM: | EXCAVATION DIMENSIONS: | CHECKED BY:

EXCAVATION AND TESTS:				ENGINEERING DESCRIPTION:							GEOLOGICAL:	
PENETRATION 1 2 3	SUPPORT	WATER	SAMPLES, TESTS	RL (m) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	SOIL NAME, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, SECONDARY AND MINOR COMPONENTS	MOISTURE CONDITION	SHEAR STRENGTH OR RELATIVE DENSITY	ESTIMATED SHEAR STRENGTH, kPa	ORIGIN TYPE, MINERAL COMPOSITION, DEFECTS, STRUCTURE	UNIT
	N/A	NOT SEEN		0		GM	Silty GRAVEL, some sand. fine to coarse, angular to sub angular. Orange Brown.				Fill	
				1.0		OL/ OH	Gravelly SILT. Mod plasticity. Green/ Dark brown. Organic Rich.				Fill	
				2.0								
				3.0								
				4.0			Test pit terminated at limit of excavator reach.					
				5.0								

SKETCH



TONKIN & TAYLOR LTD.

EXCAVATION LOG

EXCAVATION NO: TP 14
SHEET 1 OF 1

PROJECT: Hutt City Plan-Geotech Investigation | LOCATION: Kelco Grove, Kelson | JOB NO: 84009.004

CO-ORDINATES: | EXPOSURE TYPE: | HOLE STARTED:

EQUIPMENT: | HOLE FINISHED:

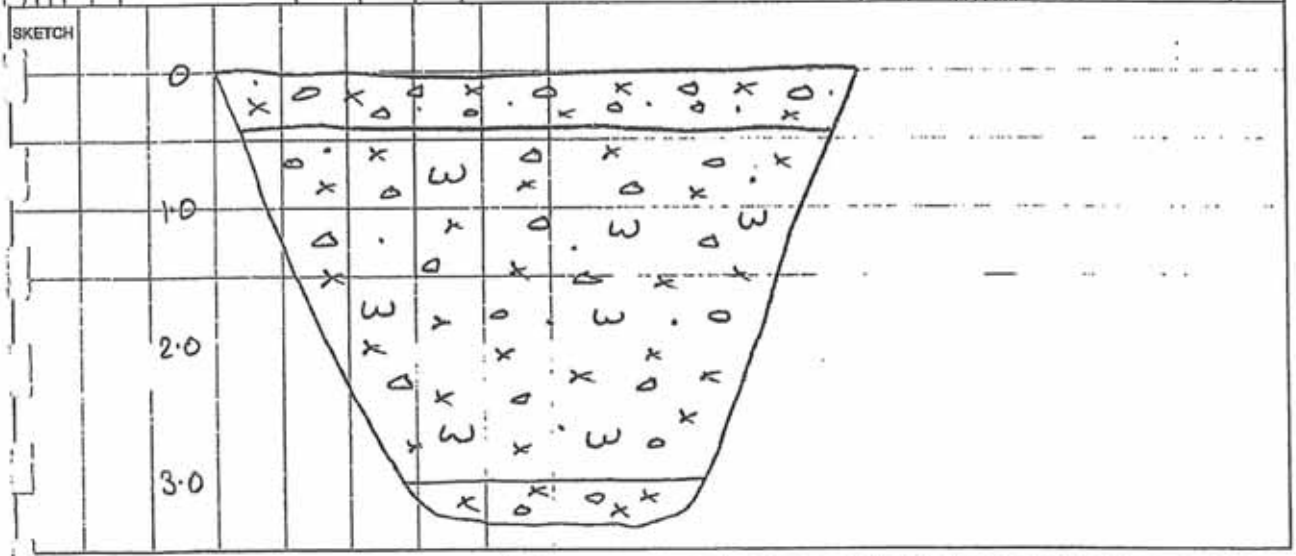
RL: | OPERATOR: | LOGGED BY:

DATUM: | EXCAVATION DIMENSIONS: | CHECKED BY:

EXCAVATION AND TESTS: | ENGINEERING DESCRIPTION: | GEOLOGICAL:

PENETRATION	SUPPORT	WATER	SAMPLES, TESTS	RL (m) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	SOIL NAME, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, SECONDARY AND MINOR COMPONENTS	MOISTURE CONDITION	SHEAR STRENGTH OR RELATIVE DENSITY	ESTIMATED SHEAR STRENGTH, kPa	ORIGIN TYPE, MINERAL COMPOSITION, DEFECTS, STRUCTURE	UNIT
1 2 3	N/A	NOT SEEN		0			Silty GRAVEL with Sand. Fine to coarse gravels, sub angular. Brown.	M			Fill	
				1.0			Gravelly SILT, some Sand. Mod plasticity. Green/ Dark brown. Rich in organics. Layered. Lower layer almost completely organic material - sticks & dark brown clays.	M			Fill	
				3.0			SILT some gravel low plasticity. Orange Brown.	M			CW Bedrock	
				4.0								

SKETCH



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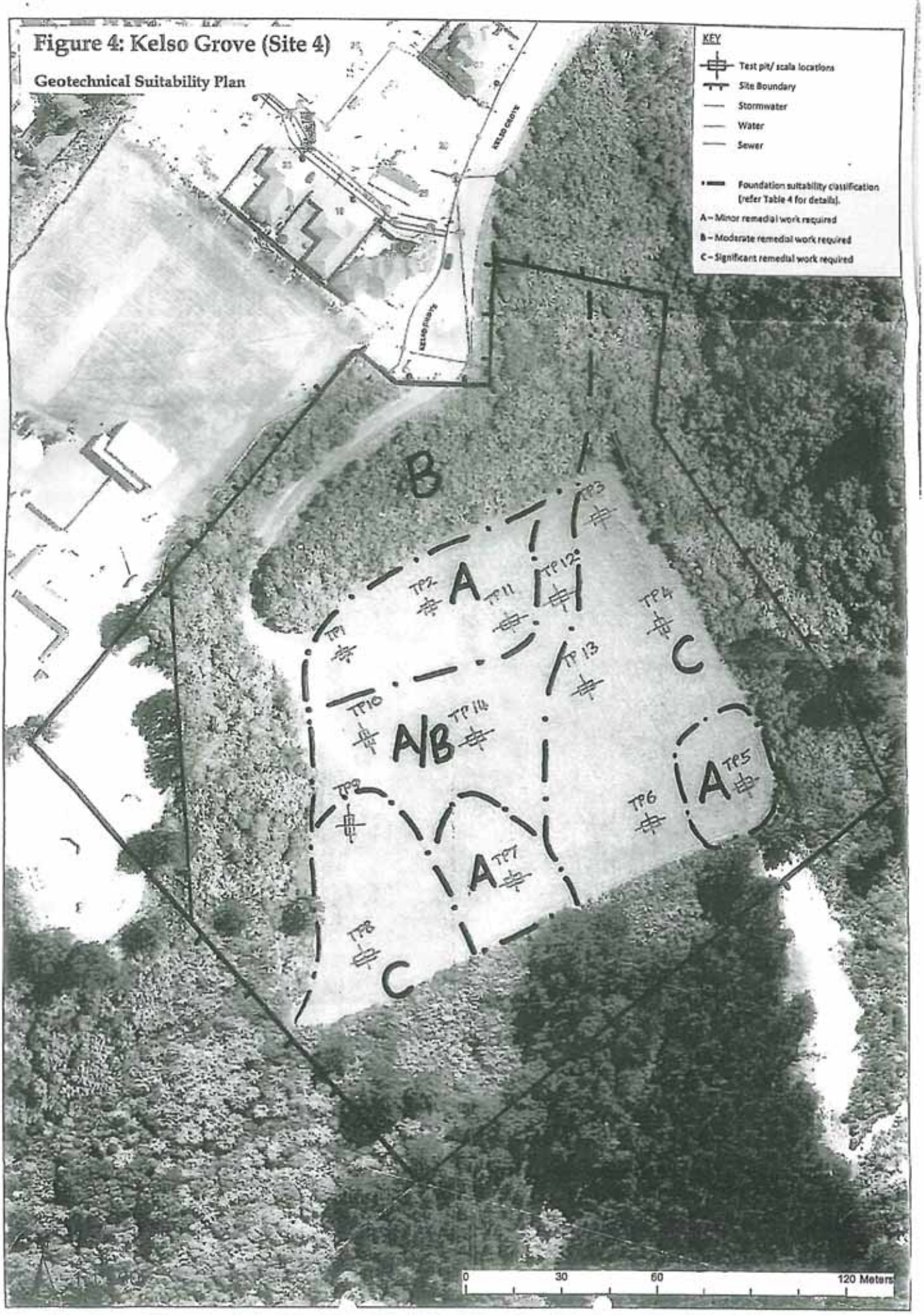
Figure 4: Kelso Grove (Site 4)
Geotechnical Suitability Plan
KEY
Test pit/ scala locations
Site Boundary
Stormwater
Water
Sewer
Foundation suitability classification (refer Table 4 for details).
A – Minor remedial work required
B – Moderate remedial work required
C – Significant remedial work required
KELSO GROVE
KELSO GROVE
B
A
C
A/B
A
A
C
TP1
TP2
TP3
TP4
TP5
TP6
TP7
TP8
TP9
TP10
TP11
TP12
TP13
TP14
0
30
60
120 Meters