BEFORE A HEARINGS PANEL APPOINTED BY THE HUTT CITY COUNCIL

IN THE MATTER OF	the Resource Management Act 1991 ("the Act" or "the RMA")
AND	
IN THE MATTER OF	the Hazardous Substances submissions of the Fuel Companies (bp Oil New Zealand Limited, Mobil Oil New Zealand Limited and Z Energy Limited) on the Proposed Hutt City District Plan ("the PDP")

STATEMENT OF EVIDENCE OF JENNIFER POLICH

FOR

BP OIL NEW ZEALAND LIMITED, MOBIL OIL NEW ZEALAND LIMITED AND Z ENERGY LIMITED ("THE FUEL COMPANIES")

11 May 2026

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1. INTRODUCTION

1.1 My name is Jennifer (Jenny) Polich. I am a Principal Engineer at Sherpa Consulting Pty Ltd (Sherpa) based in Sydney, Australia.

1.2 I have been retained by the Fuel Companies (via SLR Consulting) to provide expert evidence in relation to risk issues and land use safety planning matters, specifically use of risk management overlays in the hazardous substances provisions of the proposed Hutt City District Plan (PDP).

1.3 My qualifications are Bachelor of Engineering (Chemical) and a Masters of Environmental Engineering and Management (MEnvEng). I have over 25 years experience in process safety and risk management in the oil and gas, chemical and related industries. I have been employed by Sherpa Consulting for over fifteen years. I have previously been employed by Kellogg Brown and Root, Orica and BOC Gases in process engineering and risk engineering roles.

1.4 My prior experience relevant to this work includes numerous Quantitative Risk Assessments (QRAs) and land use planning studies relating to development of facilities handling large quantities of hazardous substances in the vicinity of other land uses and for offshore facilities. Projects include the WOSL Bulk Hydrocarbon Terminal with proposed adjacent prison development that was undertaken jointly for a Steering Committee comprising WOSL, NZ Department of Corrections and Liquigas. Other relevant work includes the QRA for the Wynyard Quarter tank terminals in relation to the change of land use for the Sea+City and America's cup project (Auckland, New Zealand), QRA and land use planning studies for a number of complex industrial facilities including the Botany Industrial Park complex (Botany, NSW, Australia), an integrated ammonium nitrate manufacturing complex which includes bulk ammonia storage, nitric acid and AN plants, chloralkali and derivatives plants, cyanide manufacture (Qld, Australia), and fuel terminal expansions at Port Botany, (NSW, Australia).

1.5 I have provided expert witness advice on risk and land use safety planning matters on behalf of various oil and gas companies in relation to the Auckland Unitary Plan (AUP) process, the Christchurch Recovery District Plan (CRDP) and the Dunedin 2GP, and for Taranaki Energy Watch in relation to the South Taranaki District Plan (STDP) and New Plymouth District Plan (NPDP).

1.6 I was also the project manager for QRAs prepared for the Z and NZOSL Seaview sites over 2024-2025. Broadly these studies showed that quantitative risk criteria

were met for existing land uses and also showed the societal risk was not intolerable but could increase if the population density in the surrounding areas were to increase.

1.7 I am also aware that Sherpa is currently updating the QRA for the Mobil site which may change the risk contours compared to the previous version used for the overlays.

1.8 I am a chartered engineer and Member of the Institute of Chemical Engineers (MIChemE). I am a Certified Functional Safety Engineer (CFSE TUV Rheinland).

2. CODE OF CONDUCT FOR EXPERT WITNESSES

2.1 I have read the Environment Court's Practice Note January 2023 as it relates to expert witnesses. My brief of evidence is prepared in compliance with the Code of Conduct, and I agree to comply with it in appearing before the Independent Hearings Panel.

2.2 I am engaged by the Fuel Companies as an independent expert. My employer Sherpa Consulting Pty Ltd provides independent risk advisory services to a range of clients in the oil and gas and energy industry and also in many other industries, as well as to regulators and not for profit advocacy groups.

2.3 I am not, and will not behave as an advocate for any party including my client. I have no other interest in the outcome of the proceedings.

2.4 I confirm that my evidence is within my area of expertise and that I have not omitted to consider material facts known to me that might alter or detract from my expressed opinions.

2.5 In preparing this evidence, I have had regard to relevant sections of:

(a) The Council's Section 42a Report on hazardous substances and contaminated land;

(b) The Council's Section 42a Report on Seaview Marina Zone;

(c) The Proposed Hutt City District Plan hazardous substances section;

(d) The submissions and further submissions of the Fuel Companies

(e) The QRA reports used to develop the risk overlays proposed by the Fuel Companies

3. SCOPE OF EVIDENCE

3.1 The scope of my evidence covers:

(a) Use of risk overlays to manage risk around facilities handling significant quantities of hazardous materials. Note that depending on the regulatory environment there are various terms that may apply to these facilities depending on the type and quantity of materials stored. (These can include terms such as 'Major Hazard Facility, "significant hazardous facility'). This evidence is not specific to a facility meeting a particular regulatory definition.

(b) Choice of specific individual fatality risk criterion for developing the risk overlay and comparison with approaches used in District Plans in other NZ regions.

(c) Requirement for a risk overlay around the pipeline between wharf and fuel terminals.

4. LAND USE SAFETY PLANNING AROUND HAZARDOUS FACILITIES

4.1 The overall purpose of land use safety planning in the vicinity of hazardous facilities is:

(a) to ensure adequate separation distances between hazardous facilities and activities sensitive to hazardous facilities in order to avoid or mitigate risk to offsite people and property and ensure residual risk is 'acceptable' based on adopted risk criteria.

(b) to avoid reverse sensitivity effects (i.e. avoid encroachment of more sensitive activities on or significant population intensification around existing hazardous facilities that then compromises existing facility operations or ability to expand).

4.2 Typically offsite risk arising from a hazardous facility is assessed by undertaking a quantitative risk assessment (QRA) and comparing the results to risk criteria adopted within a particular jurisdiction or regulatory environment.

4.3 A QRA is a technical study that involves assessing the frequency and consequence (i.e. extent of effect to fatality or injury levels) of abnormal incidents that could occur

due to a loss of containment of hazardous material with the potential to result in a fire, explosion or toxic exposure.

4.4 The type of incidents considered are high consequence low probability events. In practical terms these events occur when a number of circumstances and failures combine to allow progression of an incident pathway. This also means that a particular event would not be expected to occur at every facility however when considered industry-wide, there may be examples of the incident occurring and affecting offsite populations or infrastructure in a significant way. From a planning perspective this is a potential effect that requires consideration.

4.5 An example of this type of event for a fuel terminal such as the Seaview facilities is the 'Buncefield event' that occurred in the UK in 2005. A gasoline storage tank was overfilled which remained undetected, environmental conditions allowed the accumulation of a large flammable gas cloud that exploded, causing very significant damage for many hundreds of metres around the terminal. As the surrounding land use was industrial there was minimal population in the area as the event occurred during the night and no fatalities occurred. Other similar events have occurred at other fuel terminals.

5. STATUS OF QRAS FOR SEAVIEW FUEL FACILITIES

5.1 QRAs have been used to develop the risk overlays. These are relatively recent (2017 – 2024) for all terminals in that they use current risk assessment techniques. The exception is the BP site QRA which also includes the pipeline (2009).

5.2 QRAs can be updated to include the effect of changes in equipment or throughputs and additional control measures or improved modelling methods which will affect risk results. The 2009 BP QRA provided does not address the Buncefield scenario in a manner consistent with guidance developed after the event occurred (guidance was not released until after 2009) and to my knowledge the pipeline QRA has not been updated to address the replacement pipeline project (currently under construction).

5.3 The current QRAs do not explicitly assess cumulative risk due to potential overlap of risk affected areas around the Mobil, BP and new pipeline route areas.

6. RISK CRITERIA

6.1 There are no risk acceptance criteria available within New Zealand therefore the risk criteria commonly adopted in Australia for land use planning purposes have been often adopted in NZ for QRAs. These are the NSW Department of Planning Hazardous Industry Planning and Advisory Paper no 4 *Risk Criteria for Land Use Planning* (referred to as HIPAP4).

6.2 HIPAP4 quantitative risk criteria include:

(a) individual fatality risk criteria (which assumes exposure to the risk 24 hours a day and continuously day after day for the whole year) i.e. is effectively the risk at a location and therefore does not explicitly consider the presence of people. Different criteria apply to different land use sensitivity. This difference is a means of accounting for variations in the duration of exposure to that risk at any particular location by any one individual. People's vulnerability to the hazard and their ability to take evasive action when exposed to the hazard also need to be taken into account. This approach results in higher risk criteria being set for industrial land uses and lowest criteria for more vulnerable land uses such as hospitals, child care.

(b) societal risk which includes the effect on people and accounts for probability of presence and number of people and can also account for mitigation such as protection from being inside buildings (where relevant). Societal risk does not distinguish sensitivities of populations, simply assesses the effect of risk on numbers of people.

6.3 Appendix A provides some additional information on HIPAP4 risk criteria.

7. USE OF HIPAP4 RISK CRITERIA FOR RISK OVERLAYS IN NZ

7.1 I have been involved in developing risk overlays for various District Plans and it is important to understand the context of application of risk criteria.

7.2 Table 1 shows the residential and sensitive land use individual fatality risk criteria from HIPAP4, noting that the definition of 'sensitive uses' in land use planning does not always align with the definition of 'sensitive' in planning instruments. 'Sensitive' in land use safety planning broadly means populations difficult to manage in an emergency situation.

Table 1: HIPAP 4 Individual fatality risk criteria

Description	Risk Criteria (per year)
Fatality risk to sensitive uses – ie hospitals, schools, child-care facilities and old age housing.	0.5×10^{-6}
Fatality risk to residential and hotels, motels and tourist resorts.	1×10^{-6}

7.3 Results of QRAs have been used to determine the extent of the individual fatality risk contours which are then used to develop a risk overlay or risk management area for inclusion in a District Plan or similar planning instrument. For the purposes of setting risk management overlays in NZ individual fatality risk criteria of either $1x10^{-6}$ per year (residential, 1 in a million per year) or $0.5x10^{-6}$ per year (sensitive, 0.5 in a million per year) risk contours have been used to develop the overlays.

7.4 This approach does not explicitly consider population / number of people potentially affected by the risk but is a 'de facto' way of triggering assessment of development which can then include societal risk implications due to population increases. Note that societal risk is not materially affected by minor changes such as granny flats on existing low density residential blocks, small offices. However conversion to medium or high density uses (eg townhouses or apartments, commercial developments, significant recreational populations) will increase the societal risk.

7.5 As can be seen in the graph in Figure 1, setting a risk overlay at 0.5×10^{-6} per year minimises the likelihood of societal risk increasing into the intolerable region due to population intensification (ie increase in N number of people within the risk contour should be constrained to the ALARP region). This approach is used as it is difficult to apply a population constraint to a large area in a planning instrument that can be meaningfully enforced or monitored.

7.6 The purpose of the overlay is to provide a transparent trigger to either prevent incompatible development, or to ensure adequate assessment of development proposals by either the source of risk or in the surrounding area.

7.7 Table 2 summarises the risk context and how the HIPAP4 individual fatality risk criteria have been used in District Plan overlays for other regions I have been directly involved with.

7.8 In this context the Seaview area is similar to the Christchurch, Napier and Dunedin situations in that there is generally industrial land use, some more sensitives uses

such as residential and a marae, with Seaview Marina proposing some changes that may increase sensitivity and intensify populations.

Figure 1: HIPAP4 societal risk related to sensitive land use individual fatality risk criterion

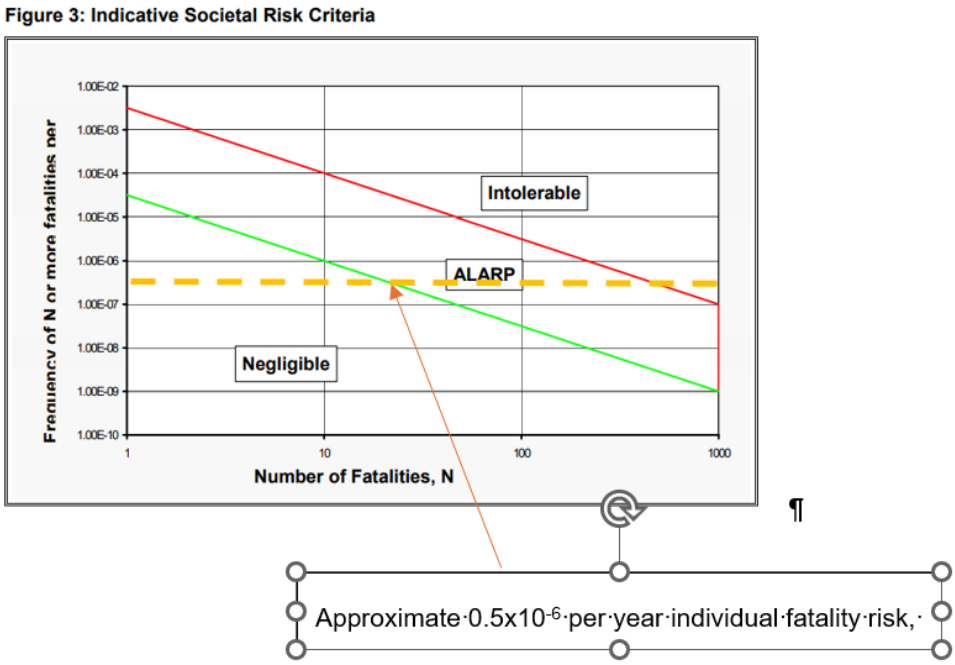


Table 2: Individual fatality risk criteria used in District Plan risk overlays

PLAN AND RISK OVERLAY AREA	SOCIETAL RISK RELEVANT?	APPROACH	CONTEXT
Auckland Unitary plan – WOSL site / prisons	Yes	Emergency planning outer overlay was based on extent of 0.5 x10^{-6} per year contours (sensitive) Building design inner overlay (not risk based)	Extensive QRA modelling was carried out including societal risk. Development on WOSL and populations on neighbouring Corrections prison is constrained via various parameters in designations to avoid future risk incompatibilities. Quarry redevelopment near WOSL was prevented from being zoned for commercial type uses, industrial only. Overlays are for emergency management and building design
Christchurch District Plan – Wooton fuel terminals	Yes	0.5x10^{-6} per year (sensitive) contour used to develop risk overlays	Largely industrial some mixed uses encroaching, intensification possible

PLAN AND RISK OVERLAY AREA	SOCIETAL RISK RELEVANT?	APPROACH	CONTEXT
Dunedin District Plan - Port fuel Terminals	Yes	$0.5x10^{-6}$ per year (sensitive) contour used to develop risk overlays	Largely industrial some mixed uses encroaching, intensification possible due to plan change
Napier District Plan – Port fuel terminals	Yes	$0.5x10^{-6}$ per year (sensitive) contour used to develop risk overlays	Existing residential adjacent to one boundary of terminal Industrial some mixed uses encroaching, intensification occurring
South Taranaki District Plan - dispersed oil and gas well and production sites	No	$1x10^{-6}$ per year (residential) contour used to develop risk overlays	Land uses in the vicinity of oil and gas facilities typically rural dwellings, low density, sensitive land uses and population intensification not relevant
New Plymouth District Plan - dispersed oil and gas well and production sites	No	$1x10^{-6}$ per year (residential) contour used to develop risk overlays	Land uses in the vicinity of oil and gas facilities typically rural dwellings, low density, sensitive land uses and population intensification not relevant

8. PIPELINE

8.1 A similar risk-based approach can be taken to setting overlays around pipelines as for fixed facilities. In NSW, Australia this approach is taken (refer to Microsoft Word - Pipeline guideline for publication 2024.DOCX which is reproduced in Appendix B). This document also provides an explanation of AS2885 which is the standard for designing and operating pipelines in Australia and NZ but does not include a requirement to carry out a QRA.

8.2 The Australian guidance includes a risk based generic recommendation for a 60m (risk-based) buffer from gasoline pipelines to sensitive land uses. The Auckland Unitary Plan Section E29.5. Notification requires notification for resource consent application for sensitive activities within 34m of some sections of the refinery pipeline. These distances are similar to the 40m distance to sensitive land use risk contour in the 2009 pipeline QRA, noting that the 2009 study did not appear to account for any specific safeguards that may have been in place such as slabbing or additional depth of cover for underground sections of pipeline.

8.3 A pipeline measurement length (ML) is a consequence-based distance that sets the area of injury effect of a pipeline rupture (i.e. worst case scenario). Under the existing pipeline AS2885 Safety Management study (SMS) the Seaview pipeline

ML is 210m and I have been advised via SLR that this is unchanged by the replacement project and that an updated AS2885 SMS is being prepared prior to replacement pipeline operations commencing.

8.4 I recognise that the pipeline replacement project may affect the risk profile due to changes in design, operating conditions and control measures adopted to manage the pipeline risk as identified in the AS2885 study. Ideally the QRA would also be updated accordingly. However in the absence of an updated QRA and with no change in the ML (ie no change in maximum consequence), in my view the existing QRA results are broadly consistent with other more current guidance and can be used at least as a placeholder.

9. CONCLUSION

9.1 In the case of Seaview fuel facilities, from the Fuel Companies perspective, the purpose of the overlay included in the proposed District Plan is to:

(a) ensure that changes in land uses remain adequately controlled to ensure that the public are not exposed to an unacceptable risk from existing operations of terminals and pipeline

(b) ensure that the fuel terminals' existing or future operations including the pipeline are not constrained by encroachment of more sensitive land uses or significantly higher populations.

9.2 The stated PRP policy objectives and definition of activity sensitive to hazardous substance risks (which includes uses that are 'residential' or 'sensitive' under HIPAP 4) are reproduced below.

HS — Hazardous Substances

The purpose of the Hazardous Substances chapter is to protect people, communities and the environment from the residual risk of facilities and activities involving the manufacture, use, storage, transportation or disposal of hazardous substances, including significant hazardous facilities. This chapter seeks to manage:

1. Reverse sensitivity ~~effects~~ between existing lawfully established significant hazardous facilities and new or intensified activities sensitive to hazardous substance risks,
2. The residual risk from significant hazardous facilities to public safety, for example, risks to the public beyond the site boundary, and
3. Management of cumulative effects of multiple significant hazardous facilities near each other.

activity sensitive to hazardous substance risks	means a: 1. residential activity, or 2. retirement village, or 3. supported residential care facility, or 4. marae, or 5. healthcare activity, or 6. educational facility, or 7. community facility, or 8. office activity, other than ancillary to an activity that is not an activity sensitive to hazardous substance risks, or 9. community corrections activity, or 10. custodial corrections facility, or 11. visitor accommodation activity, or 12. place of assembly.

9.3 It is my view that the contour for sensitive land use ($0.5x10^{-6}$ per year) is the appropriate basis for risk overlays at Seaview for the terminals and the pipeline. In my view this is a prudent planning measure and is consistent with the approach adopted in other jurisdictions.

9.4 I note that in some cases the QRA results may be outdated (particularly the BP terminal and replacement pipeline) and it would be preferable to update these to ensure they are representative of consented operations and design. However in the absence of more recent QRAs it is preferable to use these to inform the overlay rather than have no overlay at all, or at least acknowledge that the risk existing information shows a potential conflict if the Seaview Marina is developed and to require any proposed developments resulting in more sensitive land uses or population intensification to be explicitly assessed via QRA.

Jenny Polich

Principal Engineer Sherpa Consulting Pty Ltd

11 May 2026

Appendix A: HIPAP4 Risk criteria background

There are no risk acceptance criteria available within New Zealand therefore the risk criteria commonly adopted in Australia for land use planning purposes have been often adopted in NZ.

The criteria are described in the NSW Department of Planning Hazardous Industry Planning and Advisory Paper no 4 *Risk Criteria for Land Use Planning* (HIPAP4) and have been in place without significant change since the 1990s in Australia.

These are expressed quantitatively in two forms, individual fatality risk and societal risk, which are described in the following sections.

(a) Individual Fatality Risk Criteria

Individual risk represents the probability of a specified level of harm (usually fatality) occurring to a theoretical individual located permanently at a particular location, assuming no mitigating action such as escape can be taken, hence it is considered to cover vulnerable individuals such as the very young, sick or elderly.

The criteria values have been set at different levels for different land uses to reflect different sensitivities. The values themselves have been selected so that the risk level posed by industry (regarded as an involuntary risk exposure) is low in comparison to the voluntary risk exposures people accept in everyday life. HIPAP 4 risk criteria are shown in Table A.1

Individual fatality risk criteria are widely adopted for land use planning in a number of jurisdictions (Australia, Europe and parts of Asia) with similar quantitative values. In most jurisdictions, a risk of fatality of $1x10^{-6}$ per year (1 in a million per year) is a commonly applied risk criterion used in land use planning where it is considered that the risk is so low to a member of the public as to be acceptable (as highlighted in red below). In some locations a lower criterion (typically between $0.1x10^{-6}$ and $0.5x10^{-6}$ per year) is also set to explicitly cover vulnerable or sensitive populations (as per the HIPAP 4 example below)

Table A.1: HIPAP 4 Individual Fatality Risk Criteria

Description	**Risk Criteria (per year)**
Fatality risk to sensitive uses – ie hospitals, schools, child-care facilities and old age housing. (Prisons also in this category)	0.5×10^{-6}

Description	Risk Criteria (per year)
Fatality risk to residential and hotels, motels and tourist resorts.	1×10^{-6}
Fatality risk to commercial areas, including offices, retail centres, and entertainment centres.	5×10^{-6}
Fatality risk to sporting complexes and active open spaces.	10×10^{-6}
Fatality risk to be contained within the boundary of an industrial site.	50×10^{-6}

(b) Societal Risk Criteria

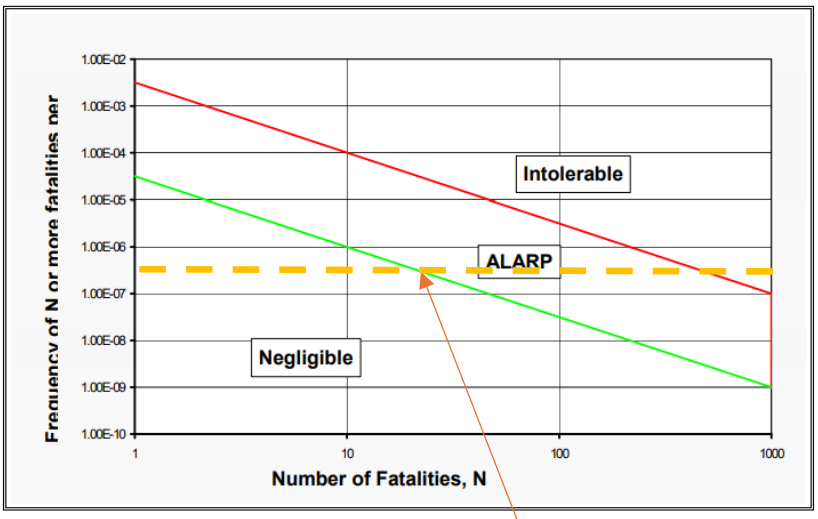
Societal risk is a measure of the probability of incidents affecting an actual population (rather than a theoretical individual as in individual risk). It is usually presented in the form of an "f-N" curve which is a graph indicating the cumulative frequency of fatality (f) of a population of size "N or more" people. Societal risk criteria are more variable in different jurisdictions compared to individual fatality risk criteria.

In general, the individual fatality risk criteria are set with regard to the lower end of the range of typical densities for the land use. Where substantially higher densities are proposed, careful consideration needs to be given to the locations and type of development and overall societal risk implications.

Societal risk is considered in three regions as reproduced below from HIPAP 4:

- "Intolerable region" represented by an upper criterion line above which the activity would be regarded as unacceptable in proximity to a population.
- "Negligible" represented by a lower criterion line below which the activity would be regarded as posing acceptable risk levels.
- Region in between where the risk may be acceptable depending on the benefits of the activity, but risk reduction measures should be implemented to reduce the risks where practicable. This is known as the "ALARP" or "as low as reasonably practicable" region.

Figure 3: Indicative Societal Risk Criteria



Approximate $0.5x10^{-6}$ per year individual fatality risk, ie societal risk frequencies are lower than individual risk criteria and decrease as potential number of people affected increases.

Setting a risk overlay at 0.1 to 0.5 $x10^{-6}$ per year minimises the likelihood of societal risk increasing into the intolerable region due to population intensification .

Appendix B: NSW Pipeline Planning Risk Assessment Guidance

Department of Planning, Housing and Infrastructure

dpie.nsw.gov.au

Guideline for planning proposals near high pressure dangerous goods pipelines

August 2024

Acknowledgement of Country

The Department of Planning, Housing and Infrastructure acknowledges that it stands on Aboriginal land. We acknowledge the Traditional Custodians of the land and we show our respect for Elders past, present and emerging through thoughtful and collaborative approaches to our work, seeking to demonstrate our ongoing commitment to providing places in which Aboriginal people are included socially, culturally and economically.

Published by NSW Department of Planning, Housing and Infrastructure

dpie.nsw.gov.au

Guideline for planning proposals near high pressure dangerous goods pipelines

First published: August 2024

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Contents

Introduction

This guideline will help planning authorities, pipeline operators and proponents identify and consider safety risks for planning proposals in the vicinity of high-pressure dangerous goods (HP DG) pipelines. It also provides requirements for proponents considering land use safety risk at the planning proposal stage.

This guideline relates to the main HP DG pipelines in NSW identified in section 2.77(3) of the State Environmental Planning Policy (Transport and Infrastructure) 2021 (T&I SEPP). These contain natural gas (methane), gasoline (liquid petroleum), ethane or jet fuel.

Natural gas and gasoline are used primarily as a fuel, ethane is principally used as a raw material for manufacturing ethylene and jet fuel is used to power aircraft. The exact locations of HP DG pipelines are withheld from the public to protect them from targeted damage and ensure community safety.

Background

HP DG pipelines exist in the NSW built environment and some traverse the state. They are subject to potential hazards – mainly from leaks, due to:

- mechanical failures, such as material defects or design and construction faults
- corrosion, including both internal and external corrosion
- ground movement and other failures due to earthquakes, heavy rains/floods, operator errors, and other natural hazards such as lightning
- third-party activity such as damage from heavy plant and machinery, drills/boring machines or hot tapping.

The impact of a potential hazard is described as its risk profile. The risk profile is generally determined by the type of material being transported, the size of an HP DG pipeline, its operating pressure, and the size and sensitivity of the population near a pipeline. In extreme circumstances, the potential consequences of a pipeline failure include asphyxiation, fires, vapour cloud explosions, toxic smoke and explosions in confined spaces.

Understanding risks in land use planning

The land use safety risk consideration distances for planning proposals near HP DG pipelines have been developed using a generic risk analysis to investigate potential land use impacts from the HP DG pipelines in operation within NSW. These distances are described in the next section.

Within the NSW planning system:

- Hazardous Industry Planning Advisory Paper No 4 - Risk Criteria for Land Use Safety Planning (PDF 355 KB) (HIPAP 4) sets out the risk criteria for land use safety planning
- Hazardous Industry Planning Advisory Paper No 10 - Land Use Safety Planning (PDF 1.10 MB) (HIPAP 10) reiterates these criteria in the context of proposed developments in the vicinity of potentially hazardous infrastructure such as HP DG pipelines.

Although HIPAP 4 and HIPAP 10 apply to development applications, their principles and criteria are also applicable to planning proposals, which are the type of proposals covered by this guideline.

Risks can be considered qualitatively and quantitatively. Qualitative risk criteria consider risk acceptability by principles, such as whether there may be a more suitable location or layout for the proposal. Quantitative risk criteria measure individual injury or fatality risks and societal risks.

Individual risk analysis can determine whether risks to individuals from a potential hazard source are too high when considering a person's vulnerability/sensitivity. This will determine whether a location is suitable for certain land uses.

Societal risk describes the risk of incidents from an existing hazard source that could potentially injure many people within a broader location. This consideration is relevant if the proposal introduces a significant population or is surrounded by a large population.

Risk specialists must be engaged to undertake quantitative risk analyses. In the context of this guideline, these analyses should consider the specifications of the pipeline, locality and surrounding land uses and populations, in accordance with Hazardous Industry Planning Advisory Paper No 6 – Hazard analysis (PDF 524 KB) (HIPAP 6), and compared against the HIPAP 4 risk criteria.

Consider this guideline in conjunction with the relevant HIPAP documents, to assist with terminology and interpretation.

Local planning direction

The 'High pressure dangerous goods pipelines' local planning direction was issued under section 9.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The direction requires councils to consider risks to the integrity of relevant pipelines, human health and the environment when preparing a planning proposal that would permit certain development adjacent to HP DG pipelines. Accordingly, this guideline applies to planning proposals near HP DG pipelines.

The department also adopts the local planning direction when preparing environmental planning instruments and for strategic and precinct planning.

The local planning direction (and this guideline) apply to planning proposals that:

- are within a defined proximity to an HP DG pipeline – meaning that a portion of, or all the planning proposal area is within the land use safety risk consideration distance from a pipeline

and

- would permit development for sensitive land uses or development that may result in a significant population increase – meaning that:
  - the planning proposal seeks to permit sensitive land uses that may introduce vulnerable people to an area (such as centre-based childcare or hospitals), or
  - other development that may result in a significant population increase carried out on land that is within the land use safety risk consideration distance from a pipeline (for example, multi-dwelling housing).

Proximity to HP DG pipelines

Table 1 outlines distances from HP DG pipelines that encompass the application area for the local planning direction and this guideline. These distances were established through the generic risk analysis.

Table 1 - Land use safety risk consideration distances from either side of the pipelines measured from the centreline of the pipeline

Gasoline pipeline (m)	Natural gas pipeline (m)	Ethane pipeline (m)	Jet fuel pipeline (m)
140	200	140	140

Considerations for development that may result in a significant population increase and sensitive land uses

The type of development is a key factor when considering potential increases in population and associated risks. Developments such as a single dwelling or local shops do not introduce significant societal risks. Societal risk is relevant for:

- development that introduces multiple dwellings
- commercial and industrial development that may increase the working population in an area, such as office buildings and multi-unit industrial offices.

The existing population density should also be considered. If an area is already high density in population, a planning proposal that permits a small group of dwellings may result in a significant population increase in that area.

The following definitions are provided as a guide. The specified land uses are defined under the Standard Instrument prescribed by the Standard Instrument (Local Environmental Plans) Order 2006.

These types of development are likely to introduce population increases that warrant a pipeline risk analysis.

Development that may result in a significant population increase means any of the following development types (including as part of mixed use development):

attached dwelling	multi-dwelling housing	residential flat building	group homes
boarding house	co-living housing	seniors housing	hostel
manor houses	health services facility	centre-based childcare	educational establishment
industrial development (excluding home industry)	entertainment facility	tourist and visitor accommodation (excluding farm stay accommodation)	commercial premises (excluding take-away food and drink premises)
correctional centre			

For sensitive land uses, the following development are considered to introduce vulnerable people who would be difficult to evacuate in the event of emergency.

Sensitive land uses means any of the following development (including as part of mixed use development):

correctional centre	centre-based childcare	health services facility (if using general anaesthetic)	school
seniors housing			

Proposals near HP DG pipelines that must consider land use safety risks

Planning proposals that introduce a sensitive use or that may result in a significant population increase include (but are not limited to) proposals that:

- permit development for sensitive uses such as hospitals and other health services facilities (if using general anaesthetic), schools, childcare centres or aged care facilities
- would introduce vulnerable people (such as occupants of aged care or a childcare centre) that may be difficult to evacuate in an emergency
- would see a significant increase in the population, such as residential apartment buildings/complexes, townhouses or commercial buildings/complexes, or a planning proposal proposing large-scale land subdivision to permit any of these uses
- significantly increase the working population of an area, including strata industrial units and multistorey industrial development.

Proposed land use changes that will result in similar occupant numbers as existing uses are unlikely to be classified as a significant population increase.

Planning proposals introducing sensitive uses or a significant population increase near a HP DG pipeline must consider land use safety risks. If a planning authority deems it appropriate, other proposals near a HP DG pipeline may also need to:

- consider risk consistent with HIPAP 6 – Hazard Analysis
- compare against the HIPAP 4 risk criteria.

Examples of where the pipeline risk is likely to need consideration include:

- a development application (DA) in an area affected by a pipeline where risk has not been assessed at planning proposal stage
- where the scale of the DA exceeds the scope assessed under the planning proposal.

Planning authorities or proponents requiring further information or clarification on identifying a planning proposal that is required to consider risk from a HP DG pipeline should contact the department's hazard team via email at hazards@planning.nsw.gov.au.

Notifying a proponent that a planning proposal must consider land use safety risk

To avoid delays and costs associated with planning proposals, proponents should have a pre-lodgement meeting with the relevant planning authority. This will determine if the relevant land requires consideration of pipeline risks.

Where this is the case, the planning authority must notify the proponent as soon as practical. Maps and spatial data that identify the land use safety risk consideration distances will be provided from the pipeline operators to all relevant planning authorities. For the protection of the HP DG pipeline infrastructure and the community, this information is not made publicly available.

Process to consider risk

Step 1: Determine if a proposal needs to consider risks

When a council (or other relevant planning authority) is made aware of a planning proposal, they can use pipeline location information provided by the department to determine if the proposal is within the land risk safety consideration distance. The council can contact the department's hazards team at hazards@planning.nsw.gov.au for advice on technical information.

Step 2: Notify the proponent

Councils need to notify proponents if consideration of risks associated with HP DG pipelines is required.

Step 3: Consider the risks

If the proposal is within the land risk safety consideration distance, and is proposing to introduce sensitive uses or development that may result in a significant population increase, the proponent will need to ensure that risks associated with the infrastructure are considered.

The proponent must engage a qualified risk specialist to prepare a quantitative risk assessment in accordance with this guideline and HIPAP 6.

The assessment must:

- demonstrate consistency with the quantitative and qualitative risk criteria as provided in HIPAP 4
- be site-specific
- consider the existing and proposed population, individual risk factors and recommended setbacks (see Table 4)
- assess the risk of propagation between the pipelines (if more than one pipeline is in the vicinity of the proposal)
- illustrate a comprehensive understanding of the hazards and risks associated with the operation of the pipeline and its operational parameters.

Step 4: Progress the planning proposal

If the council wants to progress the planning proposal, they should follow the gateway process. The department will review the pipeline risk assessment. The department's hazards team can review the technical pipeline risk report before the gateway process. Specific advice may also be requested on a case-by-case basis.

Considering risk

A qualified risk specialist must undertake any required site-specific quantitative risk analyses. The risk specialist should have the qualifications and experience to deal with the scale and complexity of the planning proposal and its associated hazards. This typically requires a specialist who possesses professional qualifications and practical experience in a relevant scientific or engineering discipline. Basic expected competencies include:

- knowledge and in-depth understanding of the hazards associated with the storage, handling and processing of hazardous substances, including dangerous goods
- knowledge and experience in hazard identification, risk evaluation, risk assessment and risk control
- knowledge and understanding of safety management studies and how to consider relevant information for the risk analysis
- knowledge and understanding of relevant legislation, codes of practice and standards, including relevant HIPAPs
- report writing.

Proponents must get location-specific pipeline information for the planning proposal from the pipeline operator on each occasion. Information from other lengths of a pipeline away from the planning proposal site may not be relevant, as different segments may have different sets of operating conditions and protection factors.

The proponent should request the information from the relevant pipeline operator directly. Information obtained from the pipeline operator is sensitive for security reasons, and must not be disclosed to any third party. The technical risk analysis report should be redacted to remove all commercially sensitive and security-sensitive information for public releases. Usually, the pipeline operating conditions and the location of the pipelines should be removed. Only the risk contours should be illustrated for public exhibition.

The information outlined in the following sections was established by a generic risk assessment of selected HP DG pipelines in NSW, and is intended to establish baseline recommendations for site-specific quantitative risk assessments.

Site specific quantitative risk assessments may provide different recommendations from those outlined below. This does not make those site-specific recommendations inconsistent with this guideline or make a proposal inappropriate for approval. There may be site-specific features or mitigating factors that affect the suggested setback distances.

Population and societal risk considerations

The current and proposed population should be considered in terms of population density, which can be determined from Census data. Population density represents the population divided by the area of a lot or suburb. Table 2 shows 2016 Census data and corresponding population density ranges. This is provided for **reference only** and serves as an indication of the population density range based on typical buildings in Sydney. The population density is categorised based on the predominant building types at a suburb level.

The site-specific risk assessment will need to establish the existing population based on its locality. The qualified risk consultant can help establish this population (both residential and employment).

Table 2 – Population density range

Typical building types for the density range	Proportion of Greater Sydney (2016 Census)	Population density range (people per km ^{2})
Separate house	74%	0 to 5,500
Townhouses, semi-detached or apartment blocks up to 2 storeys	6%	5,500 to 10,500
Apartment blocks more than 3 storeys	20%	10,500 -16,300

When considering societal risk, consider both employment and residential populations. Current employment population data is available through Transport for NSW's Journey to Work data and could be used as a guide.

The scale of development or built form may need to be reconsidered or other mitigation measures included in certain circumstances. These are where societal risk (relating to the existing and proposed population) exceeds the societal risk criteria.

A planning proposal will be assessed on its merits. Consideration is given to other factors such as economic or social benefits and environmental impacts. Pipeline risks is only one consideration.

Individual risk consideration

Individual risk considers the risk profile of the hazard to an exposed individual. It is location-specific and usually illustrated as risk contours – the closer the risk source, the higher the risk level. HIPAP 4 defines NSW individual fatality risk criteria (Table 3) that considers the different vulnerabilities of recipients. It is the only individual fatality risk criteria used for pipeline risks.

HIPAP 4 also details the individual risk criteria for injury. Generally, the risk from existing pipelines is low enough that individual risk of injury does not need to be assessed for pipeline risk.

Table 3 - Individual fatality risk criteria

Land use	Suggested criteria (risk in a million per year)
Hospitals, schools, childcare facilities, seniors housing	0.5
Residential, hotels, motels, tourist resorts	1
Commercial developments, retail centres, offices and entertainment centres	5
Sporting complexes and active open space	10
Industrial	50

Setback distances

Where an individual risk criterion for a relevant land use cannot be met, a setback will usually be required. The recommended setback distances are provided in Table 4. The setback distances provide a reference for a planning proposal in the vicinity of a pipeline, indicating whether there are land use compatibility issues with the pipeline.

Setback distances are based on the quantitative risk analysis undertaken for the worst-case representative pipelines across the Sydney metropolitan area. The risk analysis methodology is consistent with HIPAP 6 and based on conservative parameters provided by pipeline operators.

A site-specific risk analysis should be undertaken that considers the pipeline specifications including diameter and maximum allowable operating pressure. The outcome of the risk analysis will determine the setback distance specific to the planning proposal.

Table 4 - Recommended setback distances for land uses from either side of the pipeline measured from the centreline

Land uses	Gasoline pipeline (m)	Natural gas pipeline (m)	Ethane pipeline (m)	Jet fuel pipeline (m)
Residential land uses	Not required	Not required	85	Not required
Sensitive uses (e.g. school, hospital, childcare, aged care)	60	100	115	60

Multiple HP DG pipelines

Some areas are affected by multiple HP DG pipelines. The risk exposure from multiple pipelines will need to be evaluated on a case-by-case basis.

A quantitative risk assessment in accordance with HIPAP 6 will likely be required to assess the potential risk from all existing pipelines. The findings from the risk study may also provide useful information to individual developers and could potentially influence the design layout for subsequent DAs.

For proposals located near multiple HP DG pipelines, the department encourages the proponent to contact the relevant planning authority and the department as early as possible to discuss and identify potential implications for the proposal.

Consistency with this guideline

Proposals that do not align with the recommended setback distances in Table 4 and/or introduce a population density more intensive than the population group in Table 2, are not necessarily inconsistent with this guideline. They can still be supported by a planning authority.

Site-specific risk analysis may support the merit of the proposal and allow for alternative approaches to ensure risks have been appropriately considered and mitigated. For example, a proposal may revise the site layout or orientation of buildings in response to site-specific risk analysis or may establish a maximum population for uses within the proposal. In addition, if sufficient design work is done during the planning proposal stage, additional safeguards may also be considered to reduce the fire or explosion impact on the buildings and windows. A qualified risk consultant can provide further recommendations.

Other alternatives may include providing more protection to the pipeline itself, such as:

- a concrete casing around the pipeline
- reducing the risk of damage to the pipeline by setting limits on the size of excavators used when undertaking site preparation and construction works.

An effective emergency plan is often recommended. However, its effectiveness is difficult to quantify and relies highly on conducting an emergency evacuation exercise which would be difficult to implement in a residential setting.

Consideration of AS 2885

All HP DG pipelines licensed under the *Pipelines Act 1967* must comply with Australian Standard AS 2885 – Pipelines – Gas and Liquid Petroleum (AS 2885). Pipeline operators are accountable for the safety and integrity of the pipeline system and its safety management. In NSW, the pipeline regulator is in the Office of Energy and Climate Change. It is responsible for licensing HP DG pipelines. The team can help councils or relevant parties in discussions on pipeline risk management, in particular when a dispute arises. Further information on pipeline licensing requirements can be found on the NSW Climate and Energy Action website.

This team can be contacted on 02 8275-1950 or energy.reporting@planning.nsw.gov.au

Parts 0 to 5 of AS 2885 details requirements for the design, construction and operations of a pipeline. Part 6 relates to pipeline safety management and explains pipeline operators' requirements when development is encroaching on existing pipelines.

The requirements under Part 6 of AS 2885 differ from the land use safety consideration principles under the planning framework as described in State Environmental Planning Policy (Resilience and Hazards) 2021 - Chapter 3 Hazardous and offensive development, and the associated HIPAP 10 guideline. However, satisfying requirements under AS 2885 is equally important to ensure the risk to the pipeline is appropriately mitigated.

AS 2885 outlines a measurement length area from a specific pipeline and is defined based on the worst-case impact distance from the pipelines without consideration of the likelihood of occurrence of such an event. It is often referred to as 'measurement length' and established in accordance with Part 0 of AS 2885.

AS 2885 requires pipeline operators to define measurement lengths from their assets that outline the worst-case scenario impact distance in the case of pipeline failure. The measurement length is established based on a consequence analysis. It sets out an area larger than the area described in the guideline, which is a risk-based approach.

Some developments near HP DG pipelines may require a review of a pipeline operator's safety management study to mitigate any potential hazards to and from the existing pipeline from the proposed development.

A planning authority should notify and gather advice from pipeline operators as early as possible on planning proposals where risks need to be considered. This helps pipeline operators to effectively fulfill their requirements under AS 2885, and efficiently begin the process of reviewing a safety

management study if required. Information and feedback from pipeline operators will also help planning authorities in their assessment of risk.