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Pipeline Risk Management Plan

(November, 2010)



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NOVALEE NOMINEES PTY LTD AND ESTATES 77 PTY LTD

Lots 635, 739 & 740 Baldivis Road

Pipeline Risk Management Plan

401012-01492-SR-REP-0001

11-Nov-10

Hydrocarbons

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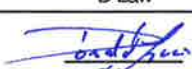
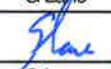
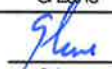
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PIPELINE RISK MANAGEMENT PLAN

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PROJECT 401012-01492-SR-REP-0001 - LOTS 635, 739 & 740 BALDIVIS ROAD

REV	DESCRIPTION	ORIG	REVIEW	WORLEY-PARSONS APPROVAL	DATE	CLIENT APPROVAL	DATE
A	Issued for internal review	DL D Law	GL G Lane	N/A N/A	29-Oct-2010	N/A	N/A
B	Issued for client review	DL D Law	GL G Lane	GL G Lane	01-Nov-2010	BY B Young	10-Nov-2010
0	Issued for use	 D Law	 G Lane	 G Lane	11-Nov-2010		



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1. INTRODUCTION

1.1 Background

The WA Planning Commission (WAPC) requires that any land development in the vicinity of high pressure gas transmission pipelines maintains certain setback distances (Ref. 1). These distances vary depending on the area of metropolitan Perth that is traversed by the pipeline.

For any proposal within the setback distances a Pipeline Risk Management Plan (PRMP) is required as part of the application for planning approval. The PRMP is required to demonstrate that:

- all threats from the pipeline have been assessed;
- additional risk mitigation measures, if required, have been identified; and
- residual risks from the pipeline to adjacent populations will be at acceptable levels consistent with AS2885: The Australian Standard for Pipelines: Gas and Liquid Petroleum (Ref. 2) and Western Australia (WA) Environmental Protection Authority (EPA) Guidance Note No.2 (Ref. 3).

The proposed residential development is located near the west side of the Baldivis Road and Serpentine Road T-junction, in Baldivis.

The proposed development will introduce occupancy parallel to the pipeline and therefore impact the area location class as defined by AS2885.1-2007. The AS2885 Location Class for the proposed development is Residential (T1). The location class is dependent on the land use and population density within the 4.7KW/m² radiation contour measurement length as per AS2885.1-2007. The "T1" primary class is due to the block size of the sub-division (i.e. less than 1 hectare).

An AS2885.1-2007 pipeline risk assessment was conducted on the 28th of Oct, 2010 according to the methodology presented in Appendix 3 for the relevant section of the Parmelia pipeline affected by the proposed subdivision. The risk assessment reassessed current threats/safeguards, determined threats to the Parmelia pipeline resulting from the proposed development and risks to the development occupants who are adjacent to the pipeline.

1.2 Purpose

This PRMP has been prepared for Novalee Nominees Pty Ltd and Estates 77 Pty Ltd. It has been prepared as per "Planning Bulletin 87" by the Western Australian Planning Commission (October 2007).

This PRMP should be read in conjunction with the AS2885.1-2007 risk assessment (refer Appendix 5) as the threats and actions identified during the risk workshop form part of this plan.

As a minimum the PRMP needs to document:

- The mitigation measures needed to achieve low, negligible or As Low As Reasonably Practicable (ALARP) risk level;



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- The responsibility for the installation of those mitigation measures;
- Any on-going management measures; and
- The responsibility for the cost of implementing the mitigation measures.

This PRMP, once endorsed by the Pipeline Operator, will need to be forwarded by the applicant to the relevant planning authority as part of the planning proposal.

1.3 Scope

This PRMP considers the section of the Parmelia Pipeline that extends within the “measurement length” (279m) from the northern and southern boundaries of the proposed development. This length corresponds to an approximate pipeline length of 1,375m near the West side of the Baldivis Road and Serpentine Road T-junction as per the Draft Structure Plan shown in Appendix 2.

The proposed development area is designated as Lots 635, 739 and 740 Baldivis Road.

The scope of the risk assessment work for this PRMP includes:

- The relevant section of the buried Parmelia Natural Gas Pipeline;
- Road and services (electricity, water, gas, communications, drainage) near the pipeline; and
- Other land use along the relevant section of the pipeline.¹

Any additional pipeline threats which become apparent due to changes in the development proposal must be reassessed.

Exclusions from the scope of the PRMP include:

- Threats that lie outside the “measurement length” from the development boundary were not considered in this assessment; and
- Threats to the pipeline during development works on Lots 635, 739 and 740. If the proposed development proceeds, the developer should:
 1. conduct a construction HAZID;
 2. produce a Pipeline Protection Plan (PPP); and
 3. follow the advice from the Pipeline Operator for any work in the vicinity of the pipeline.

¹ It is noted that Lot 569 to the South is currently planned for development (a PRMP has been prepared for that development) and the Lot(s) to the North are being developed. Therefore the risk assessment in this PRMP assumes that there are no rural properties North or South of Lots 635, 739 & 740.



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1.4 Pipeline Specification

The following pipeline details relevant to the pipeline section under review were presented and agreed at the start of the workshop:

TABLE 1 – PARMELIA TRANSMISSION PIPELINE SPECIFICATIONS

Pipeline	Parmelia (Main Line – Thomas Road to Pinjarra)
Design Code	ASME B31.8
Diameter (NB)	355.6mm
MAOP	5.61 MPag
Pipe Grade	API 5L X52
Pipe wall thickness (nominal)	5.56mm
Pipe coating	Yellow Jacket with heat shrink “canusa” sleeves on weld joints
Corrosion Prevention System	Impressed Current (Direct Current)
Depth of Burial (nominal)	750mm minimum
Distance to 4.7KW/m2	279m (full bore rupture)



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1.5 Acronyms and Abbreviations

The following acronyms and abbreviations have been used in this report.

ALARP	As Low as Reasonably Practicable {risk level}
AS	Australian Standard
CIC	Common Infrastructure Corridor
CP	Cathodic Protection
DBYD	Dial Before You Dig
DCVG	Direct Current Voltage Gradient
DOC	Depth of Cover
EIP	External Interference Protection
EPA	Environmental Protection Authority
ER	Emergency Response
HDD	Horizontal Directional Drilling
MAOP	Maximum Allowable Operating Pressure {of the pipeline as in AS2885}
MDPE	Medium Density Polyethylene
MPa	Mega Pascal
NB	Nominal Bore
POS	Public Open Space
PPP	Pipeline Protection Plan
PRMP	Pipeline Risk Management Plan
PSV	Pressure Safety Valve
QRA	Quantitative Risk Assessment
SCC	Stress Corrosion Cracking
SMS	Safety Management Study
SWMS	Safe Work Method Statement
WA	Western Australia
WAPC	Western Australian Planning Commission
WP	WorleyParsons Services Pty Ltd



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2. SETBACK DISTANCE

The setback distance is dependant on the type of land use or development and Planning Bulletin 87 tabulates various setback distances based on a pipeline depth of cover (DOC) of 760mm. These setback distances are based on the generic quantitative risk assessment (QRA) undertaken in 2004 by Advantica Worley for the Gas Pipeline Working Group.

From Planning Bulletin 87, the standard setback distance for a Residential zoned area, along the Parmelia pipeline south of Caversham, has been given as 65m (at a 90 degree angle from the pipeline).

The risk level for the relevant development set by the EPA is based on a potential fatality rate of one in a million per year or less, within the setback distance.

If the pipeline section under consideration is buried at 1200mm (i.e. deeper than the 760mm used in the QRA). Based on Figure 4 from the WorleyParsons document 450-10078-00-SR-RP-004, (produced for Agility) it is possible to determine setback distances due to different DOCs. At a depth of cover of 1200mm and a MAOP of 5.6MPa, the setback distances will be as follows:

- | | | |
|--------------------------|-------|---|
| 1) Sensitive location | = 70m | (i.e. distance to the 0.5×10^{-6} /annum risk contour) |
| 2) Residential | = 60m | (i.e. distance to the 1×10^{-6} /annum risk contour) |
| 3) Industrial/Commercial | = 0m | (i.e. distance to the 5×10^{-6} /annum risk contour) |

Also, note that as per AS2885.1-2007 requirements, the “Sensitive Use” location class is “assigned to any portion of the pipeline where there is a sensitive development within a measurement length” – i.e. for this pipeline that means anywhere within 279m from the pipeline.

So if a child-care facility (as an example) was located within the 279m, then “High Density” design requirements apply as per AS2885.1-2007. This includes, as a minimum, 50m sign spacing and a re-visit of the AS2885.1-2007 risk assessment.



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3. MITIGATION MEASURES

3.1 Risk Mitigation For Proposed Lot Developments

The following risk mitigation measures to be implemented (see Table 2) for lot development have been agreed between the developer and pipeline operator. The following 11 items either:

- have a cost impact as a result of the proposed development;
- Pose a threat to the Parmelia pipeline; or
- have a restriction on the land usage.

TABLE 2 – RISK MITIGATION DURING LOT DEVELOPMENTS

Action Number	Risk Mitigation Measure	Implementation Responsibility	Cost Responsibility
1	Increase signage through new T1 area to comply with signage requirements in AS2885 (including at road crossings).	APA	Developer
2	Developer to ensure no sensitive location (as defined in AS2885) is proposed within 279m of pipeline within Lots 635, 739 & 740 and subsequent titles.	Developer	*
3	APA to obtain parallel electrical cable data from Developer and confirm no effect on pipeline. If pipeline is adversely affected then liaise with developer to resolve.	APA	APA**
4	APA to obtain transformer information from Developer and then advise the requirements.	Developer	*
5	Developer to locate transformers as advised by APA.	Developer	Developer
6	Developer to ensure utilities running in proposed road reserve (parallel to pipeline easement) does not encroach on POS (except for drainage on POS side of roads).	Developer	*
7	Developer to ensure boundary of road reserves is at least 10m from pipeline centre line. If proposed roads cannot meet this criteria then Developer to consult with APA regarding design solutions necessary.	Developer	*



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Action Number	Risk Mitigation Measure	Implementation Responsibility	Cost Responsibility
8	APA to advise Developer as to vegetation and landscaping limitations/restrictions on easement.	APA	*
9	Developer to ensure 1200mm of cover minimum is achieved throughout development. Pipeline to be physically located in conjunction with APA to confirm location.	Developer	Developer
10	APA to ensure standard crossing requirement is provided to developer. The relevant drawing shows concrete slab requirement.	APA	Developer
11	Install concrete slab above gas pipe at sewer crossing for full width of sewer easement.	Developer	Developer

* No significant cost is expected at this stage of the proposed development but if action is not closed out satisfactorily in a timely manner then there may be cost implication for the Developer.

** Any subsequent costs will be the Developer's responsibility.



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3.2 Ongoing Management Measures

The following management measures are identified based on typical Pipeline Operator requirements. These are the measures that need to be continued on an ongoing basis until the pipeline is decommissioned:

TABLE 3 – ONGOING RISK MITIGATION MEASURES

Item	Responsibility	Management Measure
1	Pipeline Operator	Continuation of existing pipeline condition monitoring.
2		Continuation of all necessary operating and maintenance practices as per the latest approved relevant APA operating/maintenance procedures.
3		Periodic review of AS2885.1 risk assessment.
4		Liaison with all relevant Common Infrastructure Corridor users.
5		Continuation of all land management system requirements.



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4. CONCLUSIONS

The proposed development of Lots 635, 739 and 740 poses potentially ongoing threats to the APA Parmelia Pipeline and vice versa. These threats were evaluated and risk assessed, where necessary using the AS2885.1-2007 Pipeline Risk Assessment Procedure.

The workshop was conducted in a positive and constructive manner. Contributions made by the study participants (refer Appendix 1) were critical to the success of the study and this was actively encouraged. Each participant brought specific knowledge, skill, experience and judgements to the workshop.

The results of the AS2885.1-2007 risk assessment can be seen in Appendix 5.

A number of actions have been raised and responsibilities assigned to individuals – it remains the responsibility of these people to actively and expeditiously progress the actions to a suitable conclusion in order to bring the various pipeline threats to ALARP risk levels. All actions logged in Appendix 6 have been transferred to Section 3.1 of the report but Appendix 5 Risk Assessment Minutes should be referred to for the context of the actions.

Correspondence and active liaison between the Pipeline Operator and the Developer of Lots 635, 739 and 740 will be required on an ongoing basis to progress the proposed development. The actions raised also reflect this.

Should the proposed development proceed, it is recommended that a PPP be produced (and as also required by WAPC PB87) once the construction contractor has been selected but before construction begins.



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5. REFERENCES

1. High Pressure Gas Transmission Pipelines in the Perth Metropolitan Region. Planning Bulletin 87, Western Australian Planning Commission, October 2007.
2. AS2885.1: Australian Standard: Pipelines – Gas and Liquid Petroleum, Part 1 Design and Construction, 2007.
3. Guidance for Risk Assessment and Management: Off-site individual risk from Hazardous Industrial Plant, Guidance Note No.2 WA EPA, July 2000.



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Appendix 1 – Workshop Attendance Record



Meeting Attendance Record

Date 28th October 2010
Meeting topic Lots 635, 739 and 740 Baldivis Road - Pipeline Risk Management Plan
Held by WorleyParsons
Venue Level 5 Conference Room, RBA Building – 45 St Georges Tce, Perth 6000

NAME	SIGNATURE	POSITION	COMPANY
Geoff Lane		Facilitator	WP
Kamil Szajnienig		Scribe	WP
Dan Pearce		TOWN PLANNER	CD
Masoud Zaniani		Engineer	APA
PAUL REVELL		lands Co-ordinator	APA
Darrie Sturges		Manager Engineering	APA
BRUCE YOUNG		LAND owner / PROJECT MANAGER	SPG
CLAYTON WYLIE		Mech Engineer	APA
STEVE MEN		Civil Engineer	DEV ENG CONSULT.

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Appendix 2 – Draft Structure Plan

- (1) Draft Structure Plan as supplied
- (2) Draft Structure Plan showing KPs



DRAFT STRUCTURE PLAN

Lots 635, 739 + 740 Baldvis Road

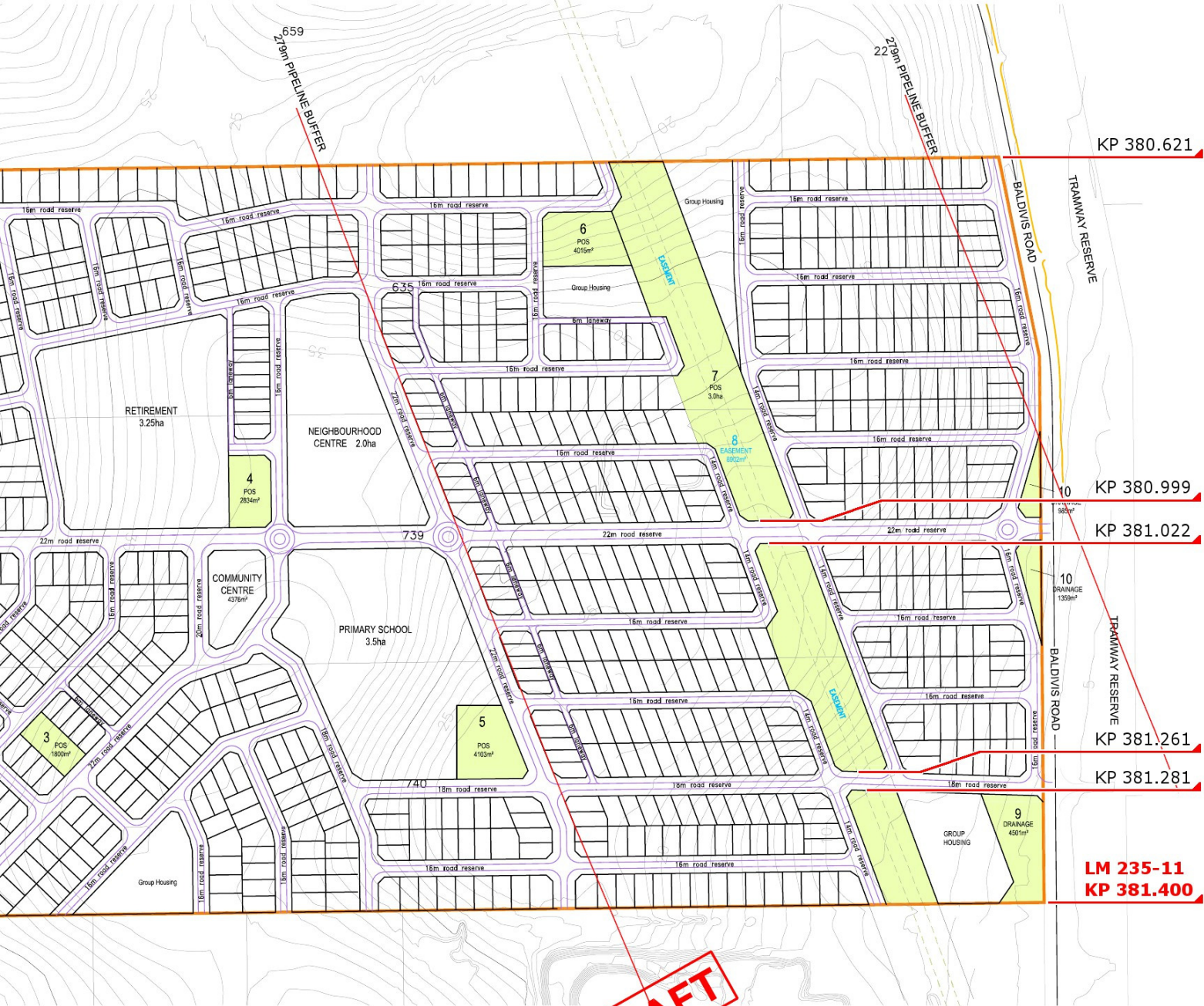
Baldvis

DRAFT

I	Relocation of Retirement	101021	LI	DP	DRAWING NUMBER	REV	I	Issued for design intent only. All areas, road, drainage are subject to detail design + survey.	robertsday
H	Redesign around POS areas	100720	JR	DP	UD1 102				perth sydney melbourne dubai
G	POS areas redesigned	100614	SB	DP	REFERENCE NUMBER				Level 1 130 Royal Street, East Perth
F	Redesign over lots 739-740	100609	SB	LI	CGC BAL				Western Australia 6004 AUSTRALIA
E	Increase POS	100519	SB	LI					T: 61 8 9218 8700 P: 61 8 9218 8701
D	Reduce POS, Apply correct	100224	SB	LI					www.robertsday.com.au
C	co-ordinates MAPS base data	100218	SB	LI					
ISSUE	DESCRIPTION	YYMMDD	DRAWN	APPVD					



KP 380.323



KP 380.621

KP 380.999

KP 381.022

KP 381.261

KP 381.281

LM 235-11
KP 381.400

DRAFT

KP 381.698



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Appendix 3 – AS2885.1-2007 Risk Assessment Methodology



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AS2885 Risk Assessment Methodology

General

The methodology for the risk assessment is outlined in AS2885.1-2007. AS2885 is the only international pipeline code for cross-country pipelines that is risk based and aimed at managing the specific threats to a pipeline. The standard focuses on the identification of all possible threats to the pipeline and the management of these threats, either by:

- physical and procedural external interference protection measures; or
- design and procedural measures to prevent the occurrence of loss of containment incidents.

The AS2885 risk assessment was conducted via a workshop with representation from the Pipeline Operator and from the Developer (refer Appendix 1).

Methodology

The methodology normally used for pipeline risk assessment is based on AS 2885.1-2007. The process is illustrated below in Figure 4 and involves the following steps:

1. Location Analysis – The pipeline route is reviewed and the general land use in the area identified. Areas of particular significance that could pose additional threats to pipeline integrity (e.g., road crossings) are noted.
2. Threat Identification – Identification of threats (using a facilitated brainstorming approach) considers all threats with the potential to damage the pipeline, cause supply interruption, cause release of fluid, or harm to people and/or environment. The safety management study team decides whether each identified threat is credible or not credible. For threats that are considered not credible, a reason for this is given and the threat not assessed further.
3. External Interference Protection – Physical and procedural measures that could reduce the threat of external interference to the pipeline are identified where applicable. If these are considered sufficient to control the threat to the pipeline (commensurate with the relevant location class), then the threat does not require further assessment.
4. Protection by Design and/or Procedures – Design measures and procedures that protect the integrity of the pipeline are identified. If these were considered sufficient to control the threat to the pipeline, then the threat does not require further assessment.
5. Failure Analysis – Where controls may not prevent failure for a particular threat, the threat is analysed to determine the damage that it may cause to the pipeline.
6. Risk Assessment – The frequency and severity of a potential event are determined, and categorised as high, intermediate, low or negligible risks using the AS2885.1-2007 risk matrix shown in Appendix 4. This qualitative risk assessment of failures is in accordance with ISO31000-2009.



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7. Risk Management – For extreme and high risks; the threat frequency or the threat consequences are modified so that the risk rank is reduced to intermediate or lower. For intermediate risks; the risk is reduced to low or negligible or ALARP is demonstrated. For low risks; monitoring is required. For negligible risks; review is required at next safety management study.

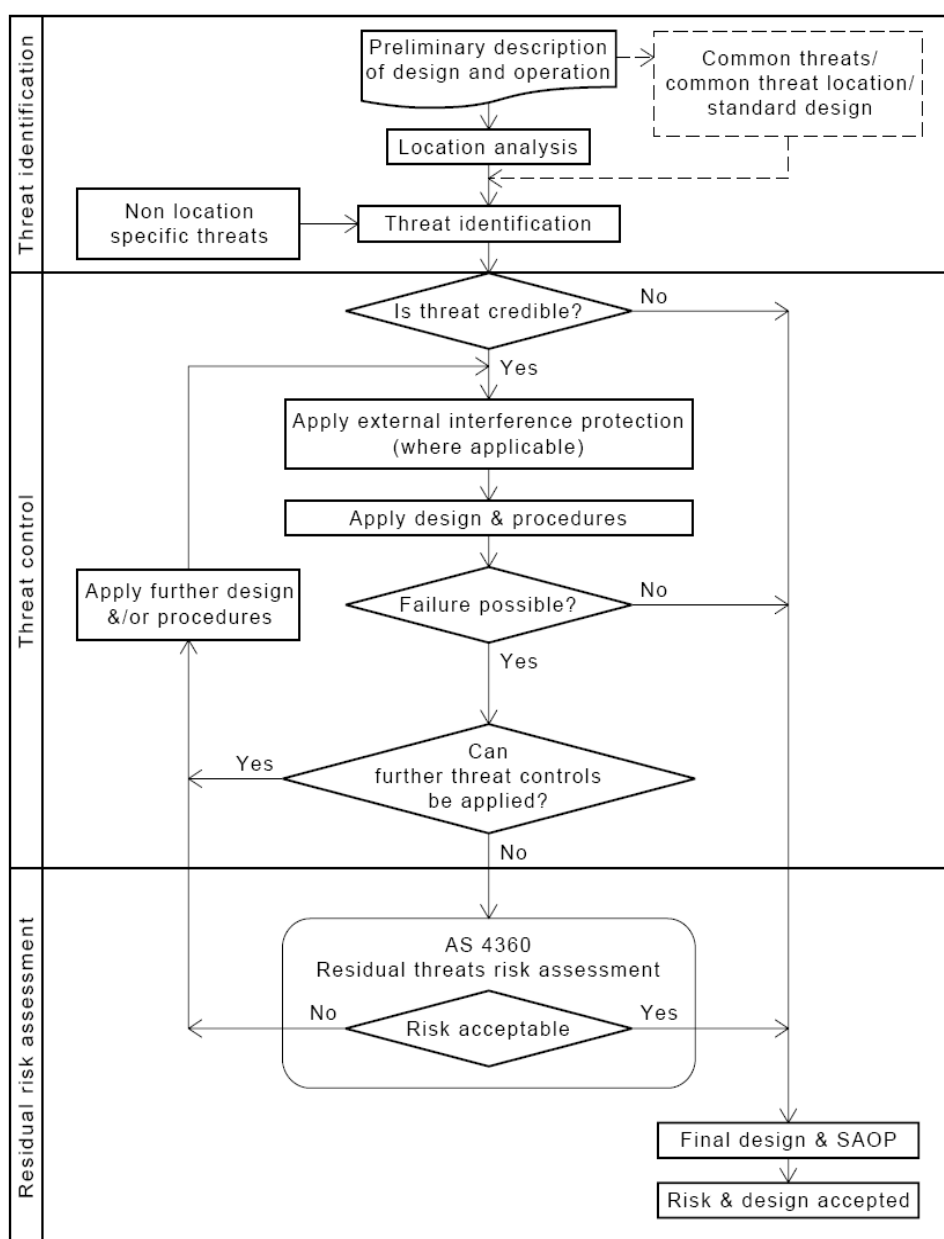


Figure 1 – The Pipeline Risk Assessment Process



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Appendix 4 – AS2885.1-2007 Risk Assessment Matrix

AS2885.1 2007 - Risk Matrix

CONSEQUENCES		Typical Severity Classes	Catastrophic	Major	Severe	Minor	Trivial
		People	Multiple fatalities result	Few fatalities, or several people with life-threatening injuries	Injury or illness requiring hospital treatment	Injuries requiring first aid treatment	Minimal impact on health & safety
		Supply	Long term Interruption of supply	Prolonged interruption; long term restriction of supply	Short term interruption; prolonged restriction of supply	Short term interruption; restriction of supply but shortfall met from other sources	No impact; no restriction of pipeline supply
		Environment NOTE: Significant environmental consequences may occur in locations which are relatively small & isolated	Effects widespread; viability of ecosystems or species affected; permanent major changes	Major off-site impact; long term severe effects; rectification difficult.	Localised (<1 ha) & short-term (<2 yr) effects, easily rectified.	Effect very localised (<0.1 ha) and very short term (weeks), minimal rectification	No effect; minor on-site effects rectified rapidly with negligible residual effect
FREQUENCY	Frequent	Expected to occur once per year or more.	Extreme	Extreme	High	Intermediate	Low
	Occasional	May occur occasionally in the life of the pipeline	Extreme	High	Intermediate	Low	Low
	Unlikely	Unlikely to occur within the life of the pipeline, but possible.	High	High	Intermediate	Low	Negligible
	Remote	Not anticipated for this pipeline at this location.	High	Intermediate	Low	Negligible	Negligible
	Hypothetical	Theoretically possible, but has never occurred on a similar pipeline	Intermediate	Low	Negligible	Negligible	Negligible

Risk Management Actions

Extreme:	Modify the threat, the frequency or the consequences so that the risk rank is reduced to 'intermediate' or lower. For an in-service pipeline the risk shall be reduced immediately.
High:	Modify the threat, the frequency or the consequences so that the risk rank is reduced to Intermediate or lower. For an in service pipeline the risk shall be reduced as soon as is possible, typically within a timescale of not more than a few weeks.
Intermediate:	Repeat threat identification and risk evaluation processes to verify and, where possible, quantify the risk estimation; determine the accuracy and uncertainty of the estimation. Where the risk rank is confirmed to be 'intermediate', if possible modify the threat, the frequency or the consequence to reduce the risk rank to 'low' or 'negligible'. Where the risk rank can not be reduced to 'low' or 'negligible', action shall be taken to- a) remove threats, reduce frequencies and/or reduce severity of consequences to the extent practicable; and b) demonstrate ALARP. For an in-service pipeline the reduction to 'low' or 'negligible' or demonstration of ALARP shall be completed as soon as possible, typically within a timescale of not more than a few months.
Low:	Determine the management plan for the threat to prevent occurrence and to monitor changes that could affect the classification.
Negligible:	Review at the next review interval.



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Appendix 5 – AS2885.1-2007 Risk Assessment Minutes

SECTION 1

Location Analysis: Pipeline traversing rural landscape with Residential areas within 'measurement length'
CIC Water corridor parallel (inundation areas no longer considered relevant)
Rural blocks (typically > 5ha and < 30ha) being developed into T1. No Sensitive areas within measurement length

Primary Location Class: T1
Secondary Locational Class: CIC

Alignment Sheet(s): n/a
Start-Finish metres: 380323 - 381698
Predominant Land use: Residential (Lots 635, 739 & 740 Baldvis Rd developed for residences). (Note - Lot 569 to south also planned for development by others. Lots to the North being developed)

Item	Chainage (m)	Threat	Threat Identification	Threat ID in APA 2008 SMS	Threat Credible (Y/N)	EIP Y/N	Controls for External Interference Protection i.e. Physical & Procedural/Design	Controls for non-EIP i.e. Procedural/Design Safeguards	Failure Possible Y/N	Further threat controls applied Y/N	Action ID	Actions	Action By	Frequency	Severity	Risk Ranking	Reduced to ALARP (Y/N)	ALARP Justification Comments	General Comments
LS - 1	380323 - 381698	Sectional.	Horizontal drilling/boring and Directional drilling - generally throughout section	2813	Y	Y	Procedural 1) Third part liaison. 2) DBYD. 3) Warning Signs. 4) Patrolling.		Y	Y	1	Increase signage through new T1 area to comply with signage requirements in AS2885 (including at road crossings).	APA - Cost by Developer	Remote	Major	Intermediate	Y	Once development completed the need for HDD is considered to be low and combined with the procedural measures in place and the action raised regarding signage, the risk is considered to be ALARP.	
LS - 2			Trench excavation - other services; Telstra cable crossing	2814	Y	Y	Physical 1) Penetration Resistance. 2) Vertical separation greater than 300mm. Procedural 1) Third part liaison. 2) DBYD. 3) Warning Signs. 4) Patrolling.		N										
LS - 3			Existing land owner services e.g. water pipe	2843	N	Y			-										Due to development to the north these threats no longer exist
LS - 4			Inundation leading to floatation.	2845	N	N		Screw anchors.	N										Inundation no longer considered relevant for this area.
LS - 5			Parallel water pipe easement - 63mm MDPE & 1400mm Steel. Expected equipment greater than 20T for excavation by Utility Provider.	2848	Y	Y	Physical 1) Separation distance > 15m. 2) Penetration Resistance may provide some protection. Procedural 1) Third part liaison. 2) DBYD. 3) Warning Signs. 4) Patrolling.		Y	Y	2	Developer to ensure no sensitive location (as defined in AS2885) is proposed within 279m of pipeline within Lots 635, 739 & 740 and subsequent titles.	Developer	Remote	Major	Intermediate	Y	ALARP achieved based on satisfactory close out of Actions 1 & 2. See also notes below worksheet.	Major consequence selected due to potential for fatalities in residential area. Remote frequency selected based on signage and water pipe separation distance from Parmelia.
LS - 6			Parallel water pipe easement - 1400mm Steel. Water pipe failure resulting in undermining of Parmelia.		Y	N		Inherent integrity of 1400mm Steel pipe (with CP) and isolation valves. Screw anchors in certain locations. Land levels such that run-off and hence undermining not considered likely. 15m separation may provide some protection.	N										
LS - 7			Excavation - Post Hole Auger, Star Picket Install, Bollard installation. Possible fence installed.	13812	Y	Y	Physical 1) Depth of cover. 2) Penetration Resistance . Procedural 1) Third part liaison. 2) Warning Signs. 3) Patrolling. 4) Legal conditions of easement.		N										
LS - 8			Firebreak Clearing, Ploughing <300mm, Miscellaneous rural activities.	13813	N	Y			-										No further rural activities relevant for this section.
LS - 9			Exploratory drilling.		N	Y			-										Exploratory drilling not considered credible in this area due to free hold land.
LS - 10			Water bore activities.		Y	Y	Physical 1) Penetration Resistance may provide some protection. Procedural 1) Third part liaison. 2) Warning Signs. 3) Patrolling. 4) DBYD. 5) Statutory requirements for water well drilling.		Y	N				Hypothetical	Major	Low	-	ALARP does not need assessment due to 'low' risk level	Major consequence selected due to potential for fatality. Hypothetical frequency selected due to statutory limitations on water well boring activities and no boring is expected along pipeline route.
LS - 11			Seismic surveys.		N	N			-										Seismic surveys not considered credible in this area.
LS - 12			Parallel Power (underground - max. 22 kV).		Y	N		Separation distance approx. 30m for 22kV power cables.	Y	Y	3	APA to obtain parallel electrical cable data from Developer and confirm no effect on pipeline. If pipeline is adversely affected then liaise with developer to resolve.	APA - but any subsequent costs by developer						Failure considered possible until action satisfactorily closed out - threat not currently risk assessed.

SECTION 1

Location Analysis: Pipeline traversing rural landscape with Residential areas within 'measurement length'
CIC Water corridor parallel (inundation areas no longer considered relevant)
Rural blocks (typically > 5ha and < 30ha) being developed into T1. No Sensitive areas within measurement length

Primary Location Class: T1
Secondary Locational Class: CIC

Alignment Sheet(s): n/a

Start-Finish metres: 380323 - 381698

Predominant Land use: Residential (Lots 635, 739 & 740 Baldvis Rd developed for residences). (Note - Lot 569 to south also planned for development by others. Lots to the North being developed)

Item	Chainage (m)	Threat	Threat Identification	Threat ID in APA 2008 SMS	Threat Credible (Y/N)	EIP Y/N	Controls for External Interference Protection i.e. Physical & Procedural/Design	Controls for non-EIP i.e. Procedural/Design Safeguards	Failure Possible Y/N	Further threat controls applied Y/N	Action ID	Actions	Action By	Frequency	Severity	Risk Ranking	Reduced to ALARP (Y/N)	ALARP Justification Comments	General Comments
LS - 13	380999-381022	New Road 1	Induced voltages due to transformer location (required for development). Stray current affecting CP leading to corrosion (and also personnel safety).		Y	N		Integrity assessments (e.g. CP Surveys, Intelligent pigging, DCVG Surveys).	N		4	APA to obtain transformer information from Developer and then advise the requirements.	APA						
											5	Developer to locate transformers as advised by APA.	Developer						
LS - 14			Utilities (civil, water, power, drainage etc.) running in road reserve adjacent to public open space and pipeline easement. Depth of sewage expected to be > 1.5m.		N	Y			-		6	Developer to ensure utilities running in proposed road reserve (parallel to pipeline easement) does not encroach on POS (except for drainage on POS side of roads).	Developer						Excavation of utilities not considered a threat to Parmelia due to utilities in proposed road reserve which is separated from Parmelia easement by 12m POS.
LS - 15			Proposed roads parallel or close to pipeline - maintenance of roads - excavation.		N	Y			-		7	Developer to ensure boundary of road reserves is at least 10m from pipeline centre line. If proposed roads cannot meet this criteria then Developer to consult with APA regarding design solutions necessary.	Developer						Threats from road are not considered credible provided a minimum separation of 10m is maintained from easement.
LS - 16			Proposed roads parallel or close to pipeline - maintenance of roads - loads/vibratory equipment.		N	N			-			See Action #7							Threats from road are not considered credible provided a minimum separation of 10m is maintained.
LS - 17			Vegetation/landscaping (including irrigation) on easement.		Y	Y	Physical 1) DOC 1200mm (irrigation piping at shallow depth) 2) Penetration Resistance Procedural 1) Third part liaison. 2) DBYD. 3) Warning Signs.		N		8	APA to advise Developer as to vegetation and landscaping limitations/restrictions on easement.	APA						
											9	Developer to ensure 1200mm of cover minimum is achieved throughout development. Pipeline to be physically located in conjunction with APA to confirm location.	Developer						
LS - 18			Pipeline Operator (APA) exposing pipe for maintenance/inspection - up to 20T excavator with flat bucket via procedure		Y	Y	Physical 1) Penetration Resistance. Procedural 1) APA Work Instruction. 2) Supervision.		Y	N				Hypothetical	Major	Low	-	ALARP does not need assessment due to 'low' risk level	APA Work Instruction WI-4.9.20 Pipeline Excavation states that a maximum excavator size of 20 tonne is to be used at any time, but only with a general purpose bucket. At no time are tiger toothed buckets allowed. There are a number of procedural controls such as Supervision, no mechanical excavation within 300mm of a sighted pipeline or within 1m of an unsighted pipeline, etc also included in the WI. Likelihood of consequence (i.e. loss of containment due to APA puncturing pipeline) considered to be hypothetical.
LS - 19	380999-381022	New Road 1	Vehicle loading.		Y	N		Calculation PAM-RA-01 to 08.	N										
LS - 20			Road Widening - front end loader or similar used to remove approx. 300mm of cover. Equipment not expected to puncture pipeline.		Y	Y	Physical 1) Depth of Cover. 2) Penetration Resistance. Procedural 1) Third part liaison. 2) DBYD. 3) Warning Signs. 4) Patrolling.		N										
LS - 21			Excavation road maintenance - front end loader or similar used to remove approximately 300mm of cover. Equipment not expected to puncture pipeline.		Y	Y	Physical 1) Depth of Cover. 2) Penetration Resistance. Procedural 1) Third part liaison. 2) DBYD. 3) Warning Signs. 4) Patrolling.		N										Light poles will be outside of the easement and therefore are not considered an additional threat at the road.
LS - 22			Vibratory Equipment.		Y	N		Third party liaison, DBYD, Patrolling - APA procedures invoked once made aware of proposed activities.	N										

SECTION 1

Location Analysis: Pipeline traversing rural landscape with Residential areas within 'measurement length'
CIC Water corridor parallel (inundation areas no longer considered relevant)
Rural blocks (typically > 5ha and < 30ha) being developed into T1. No Sensitive areas within measurement length

Primary Location Class: T1
Secondary Locational Class: CIC

Alignment Sheet(s): n/a
Start-Finish metres: 380323 - 381698
Predominant Land use: Residential (Lots 635, 739 & 740 Baldvis Rd developed for residences). (Note - Lot 569 to south also planned for development by others. Lots to the North being developed)

Item	Chainage (m)	Threat	Threat Identification	Threat ID in APA 2008 SMS	Threat Credible (Y/N)	EIP Y/N	Controls for External Interference Protection i.e. Physical & Procedural/Design	Controls for non-EIP i.e. Procedural/Design Safeguards	Failure Possible Y/N	Further threat controls applied Y/N	Action ID	Actions	Action By	Frequency	Severity	Risk Ranking	Reduced to ALARP (Y/N)	ALARP Justification Comments	General Comments
LS - 23	381261-381281	New Road 2	Excavation of utilities crossing above pipe at Road 1 (Telstra, gas, water and possibly power).		Y	Y	Physical 1) Minimum separation distance > 300mm. 2) Penetration Resistance. 3) Concrete slab between pipe and utilities. Procedural 1) Third part liaison. 2) DBYD. 3) Warning Signs. 4) Patrolling. 5) Marker Tape.		N		10	APA to ensure standard crossing requirement is provided to developer. The relevant drawing shows concrete slab requirement.	APA						
LS - 24			Excavation of utilities crossing below pipe at Road 1 (Drainage and possibly power).		Y	Y	Physical 1) Penetration Resistance. 2) Concrete Slab Procedural 1) Third part liaison. 2) DBYD. 3) Warning Signs. 4) Patrolling. 5) Marker Tape.		N										Concrete slab will prevent excavating past the gas pipe due to physical size and nature of slab.
LS - 25			Vehicle loading.		Y	N		Calculation PAM-RA-01 to 08.	N										
LS - 26			Road Widening - front end loader or similar used to remove approx. 300mm of cover. Equipment not expected to puncture pipeline.		Y	Y	Physical 1) Depth of Cover. 2) Penetration Resistance. Procedural 1) Third part liaison. 2) DBYD. 3) Warning Signs. 4) Patrolling.		N										
LS - 27			Excavation road maintenance - front end loader or similar used to remove approximately 300mm of cover. Equipment not expected to puncture pipeline.		Y	Y	Physical 1) Depth of Cover. 2) Penetration Resistance. Procedural 1) Third part liaison. 2) DBYD. 3) Warning Signs. 4) Patrolling.		N										
LS - 28			Vibratory Equipment.		Y	N		Third party liaison, DBYD, Patrolling - APA procedures invoked once made aware of proposed activities.	N										
LS - 29	381281	Power line crossing.	Excavation of utilities crossing above pipe at Road 2 (Telstra, gas, water and possibly power).		Y	Y	Physical 1) Minimum separation distance > 300mm. 2) Penetration Resistance. 3) Concrete slab between pipe and utilities. Procedural 1) Third part liaison. 2) DBYD. 3) Warning Signs. 4) Patrolling. 5) Marker Tape.		N			See Action #10							
LS - 30			Excavation of utilities crossing below pipe at Road 2 (Drainage and possibly power).		Y	Y	Physical 1) Penetration Resistance. 2) Concrete Slab Procedural 1) Third part liaison. 2) DBYD. 3) Warning Signs. 4) Patrolling. 5) Marker Tape.		N										Concrete slab will prevent excavating past the gas pipe due to physical size and nature of slab.
LS - 31	381281	Power line crossing.	Power line breakage.	13825 & 13826	N	N			-										Not credible as all power poles removed due to development.
LS - 32			Induced voltage. Power Pole replacement.		N	Y			-										Not credible as all power poles removed due to development.
LS - 33	381281 - 381400 expected	Sewer pipe crossing	Excavation of Sewer Pipe (if located in POS) via 20T. Sewer pipe goes under gas pipe.		Y	Y	Physical 1) Penetration Resistance may provide some protection. Procedural 1) Third part liaison. 2) DBYD. 3) Warning Signs. 4) Patrolling. 5) Marker Tape.		Y	Y	11	Install concrete slab above gas pipe at sewer crossing for full width of sewer easement.	Developer	Hypothetical	Major	Low	-	ALARP does not need assessment due to 'low' risk level	Hypothetical frequency selected due to added control of concrete slab above gas pipe combined with sewer design life of approx. 100 years.

SECTION 1

Location Analysis: Pipeline traversing rural landscape with Residential areas within 'measurement length'
CIC Water corridor parallel (inundation areas no longer considered relevant)
Rural blocks (typically > 5ha and < 30ha) being developed into T1. No Sensitive areas within measurement length

Primary Location Class: T1
Secondary Locational Class: CIC

Alignment Sheet(s): n/a
Start-Finish metres: 380323 - 381698
Predominant Land use: Residential (Lots 635, 739 & 740 Baldivis Rd developed for residences). (Note - Lot 569 to south also planned for development by others. Lots to the North being developed)

Item	Chainage (m)	Threat	Threat Identification	Threat ID in APA 2008 SMS	Threat Credible (Y/N)	EIP Y/N	Controls for External Interference Protection i.e. Physical & Procedural/Design	Controls for non-EIP i.e. Procedural/Design Safeguards	Failure Possible Y/N	Further threat controls applied Y/N	Action ID	Actions	Action By	Frequency	Severity	Risk Ranking	Reduced to ALARP (Y/N)	ALARP Justification Comments	General Comments
LS - 34	381684 - 381706	Baldivis Road	Vehicle loading.	13827	Y	Y		Calculation PAM-RA-01 to 08.	N										This assumes Lot 569 development proceeds as intended as at Oct 2010.
LS - 35			Road Widening - front end loader or similar used to remove approx. 300mm of cover. Equipment not expected to puncture pipeline.	13828	Y	Y	Physical 1) Depth of Cover. 2) Penetration Resistance. Procedural 1) Third part liaison. 2) DBYD. 3) Warning Signs. 4) Patrolling.		N										
LS - 36			Excavation road maintenance - front end loader or similar used to remove approximately 300mm of cover. Equipment not expected to puncture pipeline.	13829	Y	Y	Physical 1) Depth of Cover. 2) Penetration Resistance. Procedural 1) Third part liaison. 2) DBYD. 3) Warning Signs. 4) Patrolling.		N										
LS - 37			Vibratory Equipment.	13830	Y	N		Third party liaison, DBYD, Patrolling - APA procedures invoked once made aware of proposed activities.	N										
LS - 38	381684	Baldivis Road roundabout.	HDD in road reserve - if roundabout intersects with pipeline easement the potential for HDD to impact pipeline exists.		N	Y													Not considered credible due to expectation of roundabout at Baldivis Rd being at least 10m from easement
LS - 39	381680	Utilities in Baldivis Road easement.	Excavation of utilities above Parmelia - sewer, gas, water, power, telecoms - equipment < 10 tonne expected due to size of service and locality in road reserve.		Y	Y	Physical 1) Separation distance > 300mm may provide some protection. 2) Penetration Resistance. 3) Concrete slab. Procedural 1) Third part liaison. 2) DBYD. 3) Warning Signs. 4) Patrolling.		N										This assumes Lot 569 development proceeds as intended as at Oct 2010.
LS - 40	381680	Utilities in Baldivis Road easement.	Excavation of utilities below Parmelia - sewer, gas, water, power, telecoms - equipment < 10 tonne expected due to size of service and locality in road reserve.		Y	Y	Physical 1) Penetration Resistance. 2) Concrete slab above Parmelia. Procedural 1) Third part liaison. 2) DBYD. 3) Warning Signs. 4) Patrolling.		N										

Non-Locational Specific Threats (refer also AS2885 App C)

Item	Chainage (m)	Threat	Threat Identification	Threat Credible (Y/N)	EIP Y/N	Controls for EIP i.e. Physical & Procedural	Controls for non-EIP i.e. Procedural/Design Safeguards	Failure Possible Y/N	Further threat controls applied Y/N	Action ID	Actions	Action By	Frequency	Severity	Risk Ranking	Reduced to ALARP (Y/N)	ALARP Justification Comments	General Comments
NLS - 1	ALL	Corrosion	Internal due to Contaminants	N	N			-										Not credible due to sweet natural gas
NLS - 2	ALL	Corrosion	External	Y	N		Pipe coating (Yellow Jacket). Low risk soil type. CP System.	N										
NLS - 3	ALL	Corrosion	Internal Erosion (abrasion)	N	N			-										No cause of internal abrasion
NLS - 4	ALL	Corrosion	SCC / Environmental Corrosion Cracking	Y	N		Pipe coating (Yellow Jacket). Low risk soil type.	N										
NLS - 5	ALL	Corrosion	Biological Corrosion	N	N			-										No cause of biological corrosion
NLS - 6	ALL	Natural Events	Cyclones and Earthquakes	N	N			-										Cyclones and earthquakes not considered credible in this locality
NLS - 7	ALL	Natural Events	Bush fires affecting above ground piping (Threat not credible for below ground piping)	N	N			N										No above ground facilities in this section
NLS - 8	ALL	Natural Events	Lightning - leading to equipment failure	Y	N		CP survey. CP test post earthed via anode bed.	N										Not considered to be credible due to underground pipe. No nearby conductors
NLS - 9	ALL	Operations & Maintenance	Exceeding MAOP	Y	N		Operating procedures Alarms and trips Scada systems Pressure let down skids to AS2885. PSV at let down station.	N										
NLS - 10	ALL	Operations & Maintenance	Incorrect operation of Pigging	Y	N		Pigging work instructions and procedures, trained and experienced personnel.	N										
NLS - 11	ALL	Operations & Maintenance	Incorrect valve operating sequence	Y	N		Operator training and work instructions.	N										
NLS - 12	ALL	Operations & Maintenance	Incorrect operation of control & protective equipment	Y	N		Operating procedures	N										
NLS - 13	ALL	Operations & Maintenance	Bypass control system logic	Y	N		Operating procedures	N										
NLS - 14	ALL	Operations & Maintenance	Inadequate /Incomplete maintenance procedures	Y	N		External and internal audits. External validation where required. Internal reviews within maximum interval.	N										
NLS - 15	ALL	Operations & Maintenance	Maintenance actions contrary to maintenance procedures	Y	N		Basic job competency training modules and sign off. Supervision. Disciplinary procedures.	N										
NLS - 16	ALL	Operations & Maintenance	Inaccurate test equipment	Y	N		Testing and calibration of equipment by NATA.	N										
NLS - 17	ALL	Operations & Maintenance	Inadequate servicing of equipment	Y	N		APA training and competent personnel. Maintenance scheduling system (audited).	N										
NLS - 18	ALL	Design Defect	Temperature exceeds design; discharge from operating compressor stations.	N	N			-										No compressor stations within vicinity of this section.
NLS - 19	ALL	External Interference	Low DOC anywhere along pipeline	Y	N		DOC checks and continuous monitoring.	N										
NLS - 20	ALL	Operations & Maintenance	Design/as built document storage and retrieval	N	N			-										Not credible for this section due to no above ground facilities.



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LOTS 635, 739 & 740 BALDIVIS ROAD

PIPELINE RISK MANAGEMENT PLAN

Appendix 6 – AS2885.1-2007 Risk Assessment Actions

AS2885.1-2007 Risk Assessment Actions

Action #	Threat	Threat Analysis	Recommendations	Resp.
1	Sectional.	Horizontal drilling/boring and Directional drilling - generally throughout section	Increase signage through new T1 area to comply with signage requirements in AS2885 (including at road crossings).	APA - Cost by Developer
2	Sectional.	Parallel water pipe easement - 63mm MDPE & 1400mm Steel. Expected equipment greater than 20T for excavation by Utility Provider.	Developer to ensure no sensitive location (as defined in AS2885) is proposed within 279m of pipeline within Lots 635, 739 & 740 and subsequent titles.	Developer
3	Sectional.	Parallel Power (underground - max. 22 kV).	APA to obtain parallel electrical cable data from Developer and confirm no effect on pipeline. If pipeline is adversely affected then liaise with developer to resolve.	APA - but any subsequent costs by developer
4	Sectional.	Induced voltages due to transformer location (required for development). Stray current affecting CP leading to corrosion (and also personnel safety).	APA to obtain transformer information from Developer and then advise the requirements.	APA
5	Sectional.	Induced voltages due to transformer location (required for development). Stray current affecting CP leading to corrosion (and also personnel safety).	Developer to locate transformers as advised by APA.	Developer
6	Sectional.	Utilities (civil, water, power, drainage etc.) running in road reserve adjacent to public open space and pipeline easement. Depth of sewage expected to be > 1.5m.	Developer to ensure utilities running in proposed road reserve (parallel to pipeline easement) does not encroach on POS (except for drainage on POS side of roads).	Developer
7	Sectional.	Proposed roads parallel or close to pipeline - maintenance of roads - excavation.	Developer to ensure boundary of road reserves is at least 10m from pipeline centre line. If proposed roads cannot meet this criteria then Developer to consult with APA regarding design solutions necessary.	Developer
		Proposed roads parallel or close to pipeline - maintenance of roads - loads/vibratory equipment.		
8	Sectional.	Vegetation/landscaping (including irrigation) on easement.	APA to advise Developer as to vegetation and landscaping limitations/restrictions on easement.	APA
9	Sectional.	Vegetation/landscaping (including irrigation) on easement.	Developer to ensure 1200mm of cover minimum is achieved throughout development. Pipeline to be physically located in conjunction with APA to confirm location.	Developer
10	New Road 1	Excavation of utilities crossing above pipe at Road 1 (Telstra, gas, water and possibly power).	APA to ensure standard crossing requirement is provided to developer. The relevant drawing shows concrete slab requirement.	APA
	New Road 2	Excavation of utilities crossing above pipe at Road 2 (Telstra, gas, water and possibly power).		
11	Power line crossing.	Excavation of Sewer Pipe (if located in POS) via 20T. Sewer pipe goes under gas pipe.	Install concrete slab above gas pipe at sewer crossing for full width of sewer easement.	Developer