Casey Central Town Centre Precinct Structure Plan Safety Management Study

Item		Land Classification							
Item	Feature	Measurement Length (m)	Primary Land Classification - Design	From Chainage	To Chainage	Secondary Land Classification Review	From Chainage2	To Chainage2	Area Description / Land use
1	Location Classification 450NB Morwell to Dandenong Pipeline	270	T1	Length of development (including measurement on either side)					The previous location analysis for the area of this development on the pipeline route is T1 including the measurement length either side of the development (from August 2011). Sensitive developments are to be outside 60m from the pipeline and therefore outside the 4.7kW/m2 area for the largest credible hole size (95mm caused by penetration of both teeth of a 30T Excavator fitted with Tiger Teeth, the largest excavator size to be used during the construction period of this development (the largest size excavator expected following development is 12T)). Areas stated as high density in the plan are not necessarily high density in terms of T2 in AS2885 Standard. The areas of high density population (PSP terms) within this development may be greater than 10% of the total area, however APA believe this area to be not high density (although close to high density). The Mixed Use area in the South West area of the development normally rolls out as multistorey developments with ground level retail with upper level residential or office/commercial land uses. The areas outside of this development were discussed and it is expected that these areas will eventually become conventional residential areas. Therefore with this development in place in the same form as presented in this assessment is T1 with no secondary classifications. It has been proposed that a school may be built outside the area of this PSP but with the measurement length. However this are is not under analysis in this SMS but may need to be considered at a future time.
2									
3	SMS Assessment								
4	External Interference - Road crossings during construction.								Three roads will be constructed over the pipeline. All three roads will be minor roads.
5	External Interference - Road crossings during construction.								Three roads will be constructed over the pipeline. All three roads will be minor roads.
6	External Interference - Road crossings during construction.								
7	External Interference - Road crossings during construction.								
8	External Interference - Road crossings during construction.								
9	External Interference - Road crossings during construction.								

Item	Threat Identification					Pipeline Protection	
Item	General Comment	Threats	Threat ID	Credible Risk (Y/N)	Reasons this threat is not a credible risk	Pipeline Protection Measures	Hazard Prevention Measures
1	**The pipeline meets the "No Rupture" clause of AS2885.1-2012 for up to and including 55T excavators.** **Penetration Resistance (Will not penetrate under aggressive attack (B = 1.3)) for the Pipeline is as follows:** Light wall (7.9mm) (entire length of concern in this SMS) 450NB pipeline can be penetrated by a 15T Excavator with a single point of a Tiger Tooth or by a Penetration Tooth. Can be penetrated with both teeth of a Tiger Tooth by a 30T Excavator. Cannot be penetrated by an Excavator up to and including 55T using a General Purpose Tooth.					Physical Measures of Protection Depth of cover greater than or equal to 900mm. Pipe wall thickness can be considered to be second measure of protection (no rupture pipe) Concrete slabbing at road crossings 3m wide Shared Pathway (Slab) over the pipeline through the development. (In some areas the pipeline may not be under the centre of the pathway.)	Procedural Measures of Protection DBYD Liaison Activities Sign Posts to required standard. Patrols
2							
3							
4	Potential use of 30T excavator during these construction activities - Teeth would likely be general, Low possibility of Tiger Teeth. This pipeline will not rupture with this maximum size excavator, however pipeline penetration could occur with the potential maximum hole size of 95mm for Double tooth tiger or with a single tooth of a tiger tooth potential hole size of 30mm. Due to ground conditions it is thought that penetration teeth would not be used in this area and therefore penetration by these teeth is determined to be not credible.	**Threat - New Development Construction Activities - Roads** Where - below ground pipeline Responsible - landowner/developer What happens - during the installation of a new road mechanical equipment strikes and dents, gouges or penetrates the pipeline. When - during construction activities Equipment used - Potentially use of 30T excavator with tiger teeth.	1	Y		Wall thickness	SMS conditions - Development plans will adhere to conditions in this SMS and other APA documentation and be approved by APA prior to construction activities. APA Supervision DBYD Liaison activities Marker Posts
5	Potential use of 30T excavator during these construction activities - Teeth would likely be general, Low possibility of Tiger Teeth. This pipeline will not rupture with this maximum size excavator, however pipeline penetration could occur with the potential maximum hole size of 95mm for Double tooth tiger or with a single tooth of a tiger tooth potential hole size of 30mm. Due to ground conditions it is thought that penetration teeth would not be used in this area and therefore penetration by these teeth is determined to be not credible.	**Threat - New Development Construction Activities - Roads** Where - below ground pipeline Responsible - landowner/developer What happens - during the installation of a new road mechanical equipment strikes and dents, gouges or penetrates the pipeline. When - during construction activities Equipment used - Potentially use of 30T excavator with tiger teeth.	2	Y		Wall thickness	SMS conditions - Development plans will adhere to conditions in this SMS and other APA documentation and be approved by APA prior to construction activities. APA Supervision DBYD Liaison activities Marker Posts
6		**Threat - New Development Construction Activities - Roads - Installation of Traffic or Street lights** Where - below ground pipeline Responsible - landowner/developer What happens - during the installation traffic signals or street lighting on new roads mechanical equipment strikes and dents, gouges or penetrates the pipeline. When - during construction activities Equipment used - Potentially use of vertical boring machine.	3	N	This threat is not credible as no lighting towers are expected to be installed within the pipeline easement.	Wall thickness	If traffic lights are to be installed they are to be placed on a wide base to prevent deep excavation (by vertical boring) in the easement of the pipeline.
7		**Threat - New Development Construction Activities - Roads** Where - below ground pipeline Responsible - landowner/developer What happens - during the installation of a new road mechanical equipment strikes and dents, gouges or penetrates the pipeline. When - during construction activities Equipment used - Potentially use of 30T excavator with tiger teeth.	4	Y		Depth of cover Wall thickness	SMS conditions - Development plans will adhere to conditions in this SMS and other APA documentation and be approved by APA prior to construction activities. APA Supervision DBYD Liaison activities Marker Posts
8		**Threat - New Development Construction Activities - Road construction using heavy vehicles.** Where - below ground pipeline Responsible - landowner/developer What happens - during the installation of a new road mechanical equipment dents the pipeline through excessive weight. When - during construction activities Equipment used - heavy equipment.	5	N	All vehicles will be road legal and therefore not have significant impact on the pipeline. This threat is not credible.	Depth of cover Wall thickness	SMS conditions - Development plans will adhere to conditions in this SMS and other APA documentation and be approved by APA prior to construction activities. APA Supervision DBYD Liaison activities Marker Posts
9	Construction methodology required prior to construction activities and to be approved by APA.	**Threat - New Development Construction Activities - Road construction compaction.** Where - below ground pipeline Responsible - landowner/developer What happens - during the installation of a new road mechanical equipment compaction dents the pipeline. When - during construction activities Equipment used - .	6	Y		Depth of cover Wall thickness	SMS conditions - Development plans will adhere to conditions in this SMS and other APA documentation and be approved by APA prior to construction activities. APA Supervision DBYD Liaison activities Marker Posts

Item	Failure Analysis			Physical and Procedural Protection Measures												
Item	Failure Analysis Required (Y/N)	Failure Analysis Results	Failure Analysis Comments	Minimum Depth of cover at time of Pipeline Construction.	Coating Type	Concrete Slabs in table drains	Casing Pipe	Pipe Grade	Wall Thickness	Wall Thickness From	Wall Thickness To	Marker Posts in accordance with AS2885.1 Requirements	Buried Marker Tape	Pipeline Patrols	Liaison Activities	One Call Service in Operation
1																
2																
3																
4	Y	Threat - penetration of the pipeline by both teeth of an excavator fitted with tiger teeth causes ignition and death/ serious injury to excavator operator or spotter. Design features - wall thickness. Failure mode - loss of wall thickness, pinhole, hole Failure dimensions - 0-3mm (pinhole), 3mm - 12mm (intermediate), 12mm - 95mm (Major) Location - pipeline Escaping fluid - lighter than air natural gas Energy release rate - (Pinhole 3mm) 0.001 GJ/ s Radiation distances of 2m and 1m for 4.7kW/ m2 and 12.6kW/ m2 respectively, (Intermediate 12mm) 0.012GJ/ s Radiation distances of 6m and 4m for 4.7kW/ m2 and 12.6kW/ m2 respectively, (Major 95mm) 0.778GJ/ s Radiation distances of 46m and 29m for 4.7kW/ m2 and 12.6kW/ m2 respectively. Environmental effects - N/ A														
5	Y	Threat - penetration of the pipeline by a single tooth of an excavator fitted with tiger teeth causes ignition and death/ serious injury to excavator operator or spotter. Design features - wall thickness. Failure mode - loss of wall thickness, pinhole, hole Failure dimensions - 0-3mm (pinhole), 3mm - 12mm (intermediate), 12mm - 30mm (Major) Location - pipeline Escaping fluid - lighter than air natural gas Energy release rate - (Pinhole 3mm) 0.001 GJ/ s Radiation distances of 2m and 1m for 4.7kW/ m2 and 12.6kW/ m2 respectively, (Intermediate 12mm) 0.012GJ/ s Radiation distances of 6m and 4m for 4.7kW/ m2 and 12.6kW/ m2 respectively, (Major 30mm) 0.078GJ/ s Radiation distances of 15m and 9m for 4.7kW/ m2 and 12.6kW/ m2 respectively. Environmental effects - N/ A														
6	N	Threat - penetration of the pipeline by drilling equipment causes ignition and death/ serious injury to drill operater or spotter. (Pilot drill only 50mm max. hole) Design features - wall thickness. Failure mode - loss of wall thickness, pinhole, hole Failure dimensions - 0-3mm (pinhole), 3mm - 12mm (intermediate), 12mm - 50mm (Major) Location - station Escaping fluid - lighter than air natural gas Energy release rate - (Pinhole 3mm) 0.001 GJ/ s Radiation distances of 2m and 1m for 4.7kW/ m2 and 12.6kW/ m2 respectively, (Intermediate 12mm) 0.012GJ/ s Radiation distances of 6m and 4m for 4.7kW/ m2 and 12.6kW/ m2 respectively, (Major 50mm) 0.215GJ/ s Radiation distances of 15m and 25m for 4.7kW/ m2 and 12.6kW/ m2 respectively. Environmental effects - N/ A	Failure analysis carried out for completeness for this threat													
7	Y	Threat - penetration of the pipeline by excavation equipment causes supply issues. Design features - wall thickness. Failure mode - loss of wall thickness, pinhole, hole Failure dimensions - 0-3mm (pinhole), 3mm - 12mm (intermediate), 12mm - 95mm (Major) Location - pipeline Escaping fluid - lighter than air natural gas Energy release rate - (Pinhole 3mm) 0.001 GJ/ s Radiation distances of 2m and 1m for 4.7kW/ m2 and 12.6kW/ m2 respectively, (Intermediate 12mm) 0.012GJ/ s Radiation distances of 6m and 4m for 4.7kW/ m2 and 12.6kW/ m2 respectively, (Major 95mm) 0.778GJ/ s Radiation distances of 46m and 29m for 4.7kW/ m2 and 12.6kW/ m2 respectively. Environmental effects - N/ A	Supply issues would only be to local area as other areas supply would be met by other pipelines.													
8	N															
9	N		With APA reviewing and approving the road construction methodology this threat does not require a failure analysis to be undertaken.													

Item	Risk Evaluation					Actions				Risk Management Actions taken following final report for Risk Assessment.	
Item	Risk Evaluation Required	Frequency (AS2885.1 Model)	Consequences (AS2885.1 Model)	Pipeline Risk	Considerations	Actions	Required by	Responsibility	Date Completed	Actions taken	Risk after all actions taken
1											
2											
3											
4	Y	Hyp.	Maj.	Low	APA excavation procedures near the pipeline to be in place. During construction concrete slabs to be installed over the pipeline for these roads.	Council will request input from APA in regards to this construction. APA to provide input and its excavation procedures near the pipeline to developer/Council. During road construction concrete slabs to be installed over the pipeline for the width of the road reserve to APA requirements for these roads.	Prior to construction activities Prior to construction activities During construction activities	Council/Developer APA Developer			
5	Y	Hyp.	Maj.	Low	APA excavation procedures near the pipeline to be in place. During construction concrete slabs to be installed over the pipeline for these roads.	Council will request input from APA in regards to this construction. APA to provide input and its excavation procedures near the pipeline to developer/Council. During road construction concrete slabs to be installed over the pipeline for the width of the road reserve to APA requirements for these roads.	Prior to construction activities Prior to construction activities During construction activities	Council/Developer APA Developer			
6	N					If traffic lights are to be installed they are to be placed on a wide base to prevent deep excavation (by vertical boring) in the easement of the pipeline.	Prior to any installation	Developer			
7	Y	Rem	Sev	Low							
8	N										
9	N					Construction methodology required prior to construction activities and to be approved by APA. Prove the cold formed bend prior to construction activities. This bend is subject to this threat. Restriction of access may be required during construction activities for vehicle access and compaction activities.	Prior to construction activities Prior to construction activities During construction activities	Council/Developer/APA APA Developer			

Item		Land Classification								Threat Identification					Pipeline Protection		Failure Analysis			Physical and Procedural Protection Measures																	Risk Evaluation					Actions				Risk Management	
																																												Actions taken following final report for Risk Assessment.	
Item	Feature	Measurement Length (m)	Primary Land Classification - Design	From Chainage	To Chainage	Secondary Land Classification Review	From Chainage2	To Chainage2	Area Description / Land use	General Comment	Threats	Thrats ID	Credible Risk (Y/N)	Reasons why threat is not credible risk	Pipeline Protection Measures	Hazard Prevention Measures	Failure Analysis Required (Y/N)	Failure Analysis Results	Failure Analysis Comments	Minimum Depth of cover at time of Pipeline Construction	Casing Type	Concrete Slabs on stake drains	Casing Pipe	Pipe Grade	Wall Thickness	Wall Thickness From	Wall Thickness To	Marker Posts in accordance with AS2885.1 Requirements	Buried Marker Tape	Pipeline Patrols	Liaison Activities	One Call Service or Operation	Risk Evaluation Required	Frequency (AS2885.1 Model)	Consequences (AS2885.1 Model)	Pipeline Risk	Considerations	Actions	Required by	Responsibility	Date Completed	Action taken	Risk after all actions taken
10	Enternal Interference - Cycle Path										**Threat - New Development Construction Activities - Cycle Path lighting installation** Where - below ground pipeline Responsible - landowner/developer What happens - during the installation of cycle path lighting mechanical equipment strikes and dents, gouges or penetrates the pipeline. When - during construction activities Equipment used – Potentially use of vertical boring machine.	7	N	This threat is not credible as no lighting towers are expected to be installed within the pipeline easement.	Wall thickness	If lights are to be installed they are to be placed on a wide base to prevent deep excavation (by vertical boring) in the vicinity of the pipeline.	N	Threat - penetration of the pipeline by drilling equipment causes ignition and death/ serious injury to drill operater or sporter. (Pilot drill only 50mm max. hole) Design features - wall thickness. Failure mode - loss of wall thickness, pinhole, hole Failure dimensions - 0-3mm (pinhole), 3mm - 12mm (intermediate), 12mm - 50mm (Major) Location - station Escaping fluid - lighter than air natural gas Energy release rate - (Pinhole 3mm) 0.001 GJ/ s Radiation distances of 2m and 1m for 4.7kW/ m2 and 12.6kW/ m2 respectively, (Intermediate 12mm) 0.012GJ/ s Radiation distances of 6m and 4m for 4.7kW/ m2 and 12.6kW/ m2 respectively, (Major 50mm) 0.215GJ/ s Radiation distances of 15m and 25m for 4.7kW/ m2 and 12.6kW/ m2 respectively. Environmental effects - N/ A	Failure analysis carried out for completeness for this threat																																	
11	External Interference - New Development Construction Activities - Retarding basin								Level of excavation is at pipeline level, will be installed under the pipeline in these cases. Likely to be concrete pipelines.	Potential use of 30T excavator during these construction activities - Teeth would likely be general, Low possibility of Tiger Teeth. This pipeline will not rupture with this maximum size excavator, however pipeline penetration could occur with the potential maximum hole size of 95mm for Double tooth tiger or with penetration tooth of 30 for single tooth.	**Threat - New Development Construction Activities - Sewers and Drainage Pipeline into Retarding Basin** Where - below ground pipeline Responsible - landowner/developer What happens - during the installation of a new sewer system mechanical equipment strikes and dents or gouges the pipeline. When - during construction activities Equipment used – .	8	Y		Wall thickness	SMS conditions - Development plans will adhere to conditions in this SMS and other APA documentation and be approved by APA prior to construction activities. APA Supervision DBYD Liaison activities Marker Posts	Y	Threat - penetration of the pipeline by both teeth of an excavator fitted with tiger teeth causes ignition and death/ serious injury to excavator operator or sporter. Design features - wall thickness. Failure mode - loss of wall thickness, pinhole, hole Failure dimensions - 0-3mm (pinhole), 3mm - 12mm (intermediate), 12mm - 95mm (Major) Location - pipeline Escaping fluid - lighter than air natural gas Energy release rate - (Pinhole 3mm) 0.001 GJ/ s Radiation distances of 2m and 1m for 4.7kW/ m2 and 12.6kW/ m2 respectively, (Intermediate 12mm) 0.012GJ/ s Radiation distances of 6m and 4m for 4.7kW/ m2 and 12.6kW/ m2 respectively, (Major 95mm) 0.778GJ/ s Radiation distances of 46m and 29m for 4.7kW/ m2 and 12.6kW/ m2 respectively. Environmental effects - N/ A																				Y	Hyp.	Maj.	Low	APA excavation procedures near the pipeline to be in place. During construction concrete slabs to be installed over the pipeline for these roads.	Council will request input from APA in regards to this construction. APA to provide input and its excavation procedures near the pipeline to developer/Council. During construction concrete slabs to be installed between the APA pipeline and the services and above the pipeline.	Prior to construction activities Prior to construction activities During construction activities	Council/Developer APA Developer			
12	External Interference - New Development Construction Activities - Retarding basin								Level of excavation is at pipeline level, will be installed under the pipeline in these cases. Likely to be concrete pipelines.	Potential use of 30T excavator during these construction activities - Teeth would likely be general, Low possibility of Tiger Teeth. This pipeline will not rupture with this maximum size excavator, however pipeline penetration could occur with the potential maximum hole size of 95mm for Double tooth tiger or with penetration tooth of 30 for single tooth.	**Threat - New Development Construction Activities - Sewers and Drainage Pipeline into Retarding Basin** Where - below ground pipeline Responsible - landowner/developer What happens - during the installation of a new sewer system mechanical equipment strikes and dents or gouges the pipeline. When - during construction activities Equipment used – .	9	Y		Wall thickness	SMS conditions - Development plans will adhere to conditions in this SMS and other APA documentation and be approved by APA prior to construction activities. APA Supervision DBYD Liaison activities Marker Posts	Y	Threat - penetration of the pipeline by a single tooth of an excavator fitted with tiger teeth causes ignition and death/ serious injury to excavator operator or sporter. Design features - wall thickness. Failure mode - loss of wall thickness, pinhole, hole Failure dimensions - 0-3mm (pinhole), 3mm - 12mm (intermediate), 12mm - 30mm (Major) Location - pipeline Escaping fluid - lighter than air natural gas Energy release rate - (Pinhole 3mm) 0.001 GJ/ s Radiation distances of 2m and 1m for 4.7kW/ m2 and 12.6kW/ m2 respectively, (Intermediate 12mm) 0.012GJ/ s Radiation distances of 6m and 4m for 4.7kW/ m2 and 12.6kW/ m2 respectively, (Major 30mm) 0.078GJ/ s Radiation distances of 15m and 9m for 4.7kW/ m2 and 12.6kW/ m2 respectively. Environmental effects - N/ A																				Y	Hyp.	Maj.	Low	APA excavation procedures near the pipeline to be in place. During construction concrete slabs to be installed over the pipeline for these roads.	Council will request input from APA in regards to this construction. APA to provide input and its excavation procedures near the pipeline to developer/Council. During construction concrete slabs to be installed between the APA pipeline and the services and above the pipeline.	Prior to construction activities Prior to construction activities During construction activities	Council/Developer APA Developer			
13	External Interference - New Development Construction Activities - Sewers									Potential use of 30T excavator during these construction activities - Teeth would likely be general, Low possibility of Tiger Teeth. This pipeline will not rupture with this maximum size excavator, however pipeline penetration could occur with the potential maximum hole size of 95mm for Double tooth tiger or with penetration tooth of 30 for single tooth.	**Threat - New Development Construction Activities - Sewers** Where - below ground pipeline Responsible - landowner/developer What happens - during the installation of a new sewer system mechanical equipment strikes and dents or gouges the pipeline. When - during construction activities Equipment used – .	10	Y		Wall thickness	SMS conditions - Development plans will adhere to conditions in this SMS and other APA documentation and be approved by APA prior to construction activities. APA Supervision DBYD Liaison activities Marker Posts	Y	Threat - penetration of the pipeline by both teeth of an excavator fitted with tiger teeth causes ignition and death/ serious injury to excavator operator or sporter. Design features - wall thickness. Failure mode - loss of wall thickness, pinhole, hole Failure dimensions - 0-3mm (pinhole), 3mm - 12mm (intermediate), 12mm - 95mm (Major) Location - pipeline Escaping fluid - lighter than air natural gas Energy release rate - (Pinhole 3mm) 0.001 GJ/ s Radiation distances of 2m and 1m for 4.7kW/ m2 and 12.6kW/ m2 respectively, (Intermediate 12mm) 0.012GJ/ s Radiation distances of 6m and 4m for 4.7kW/ m2 and 12.6kW/ m2 respectively, (Major 95mm) 0.778GJ/ s Radiation distances of 46m and 29m for 4.7kW/ m2 and 12.6kW/ m2 respectively. Environmental effects - N/ A																				Y	Hyp.	Maj.	Low	APA excavation procedures near the pipeline to be in place. During construction concrete slabs to be installed over the pipeline for these roads.	Council will request input from APA in regards to this construction. APA to provide input and its excavation procedures near the pipeline to developer/Council. During construction concrete slabs to be installed between the APA pipeline and the services and above the pipeline.	Prior to construction activities Prior to construction activities During construction activities	Council/Developer APA Developer			
14	External Interference - New Development Construction Activities - Sewers									Potential use of 30T excavator during these construction activities - Teeth would likely be general, Low possibility of Tiger Teeth. This pipeline will not rupture with this maximum size excavator, however pipeline penetration could occur with the potential maximum hole size of 95mm for Double tooth tiger or with penetration tooth of 30 for single tooth.	**Threat - New Development Construction Activities - Sewers** Where - below ground pipeline Responsible - landowner/developer What happens - during the installation of a new sewer system mechanical equipment strikes and dents or gouges the pipeline. When - during construction activities Equipment used – .	11	Y		Wall thickness	SMS conditions - Development plans will adhere to conditions in this SMS and other APA documentation and be approved by APA prior to construction activities. APA Supervision DBYD Liaison activities Marker Posts	Y	Threat - penetration of the pipeline by a single tooth of an excavator fitted with tiger teeth causes ignition and death/ serious injury to excavator operator or sporter. Design features - wall thickness. Failure mode - loss of wall thickness, pinhole, hole Failure dimensions - 0-3mm (pinhole), 3mm - 12mm (intermediate), 12mm - 30mm (Major) Location - pipeline Escaping fluid - lighter than air natural gas Energy release rate - (Pinhole 3mm) 0.001 GJ/ s Radiation distances of 2m and 1m for 4.7kW/ m2 and 12.6kW/ m2 respectively, (Intermediate 12mm) 0.012GJ/ s Radiation distances of 6m and 4m for 4.7kW/ m2 and 12.6kW/ m2 respectively, (Major 30mm) 0.078GJ/ s Radiation distances of 15m and 9m for 4.7kW/ m2 and 12.6kW/ m2 respectively. Environmental effects - N/ A																				Y	Hyp.	Maj.	Low	APA excavation procedures near the pipeline to be in place. During construction concrete slabs to be installed over the pipeline for these roads.	Council will request input from APA in regards to this construction. APA to provide input and its excavation procedures near the pipeline to developer/Council. During construction concrete slabs to be installed between the APA pipeline and the services and above the pipeline.	Prior to construction activities Prior to construction activities During construction activities	Council/Developer APA Developer			
15	External Interference - New Development Construction Activities - Buildings									Potential use of 30T excavator during these construction activities - Teeth would likely be general, Low possibility of Tiger Teeth. This pipeline will not rupture with this maximum size excavator, however pipeline penetration could occur with the potential maximum hole size of 95mm for Double tooth tiger or with penetration tooth of 30 for single tooth.	**Threat - New Development Construction Activities - Buildings** Where - below ground pipeline Responsible - landowner/developer What happens - during the installation of a new building mechanical equipment strikes and dents or gouges the pipeline. When - during building installation activities Equipment used - Backhoe, ditch witch, and small excavator.	12	N	No new buildings will be constructed over the pipeline or on the pipeline easement.			N																	N				No new buildings will be constructed over the pipeline.	Council to ensure no new buildings will be constructed over the pipeline	During development planning	Council			
16	External Interference - Road Traffic Loading post construction										**Threat - Road traffic loading** Where - below ground pipeline at road crossings Responsible - road users/maintainers/construction vehicles What happens - heavy vehicles used over pipeline causing stress on the pipeline. When - indeterminate Equipment used - heavy vehicles	13	N	Not considered credible due as all crossings will be road legal			N																	N										
17	External Interference - heavy vehicle traffic on a non road crossings of the pipeline									Construction management plan will address this threat after approval by APA	**Threat - Heavy vehicle traffic on non road crossings during construction activities** Where - below ground pipeline Responsible - construction crews What happens - heavy vehicles used over pipeline causing stress on the pipeline. When - during development construction Equipment used - heavy vehicles	14	N	This threat will not be a credible risk to the pipeline following approval of construction methodology by APA Group.			N																	N				Construction methodology required prior to construction activities and to be approved by APA.	APA to put this in their input to council to prevent vehicles from easement across during construction activities. APA to be presented with Construction methodology and Construction company to seek APA approval for construction methodology in the pipeline easement.	Prior to construction activities Prior to construction activities	APA APA/Developer			
18	External Interference - Cover reduction by wet weather traffic on a non road crossing over the pipeline.									Construction management plan will address this threat after approval by APA	**Threat - Cover reduction through wet weather traffic** Where - below ground pipeline Responsible - construction crews What happens - heavy vehicles used over pipeline causing cover reduction. When - during development construction and wet weather Equipment used - heavy vehicles	15	N	This threat will not be a credible risk to the pipeline following approval of construction methodology by APA Group. Following construction this threat will not be credible due to depth of pipeline burial.			N																	N				Construction methodology required prior to construction activities and to be approved by APA.	APA to put this in their input to council to prevent vehicles from easement across during construction activities. APA to be presented with Construction methodology and Construction company to seek APA approval for construction methodology in the pipeline easement.	Prior to construction activities Prior to construction activities	APA APA/Developer			

Item		Land Classification								Threat Identification					Pipeline Protection		Failure Analysis			Physical and Procedural Protection Measures																Risk Evaluation					Actions				Risk Management	
																																											Actions taken following final report for Risk Assessment.	
Item	Feature	Measurement Length (m)	Primary Land Classification - Design	From Chainage	To Chainage	Secondary Land Classification Review	From Chainage2	To Chainage2	Area Description / Land use	General Comment	Threats	Threat ID	Credible Risk (Y/N)	Reasons why threat is not credible risk	Pipeline Protection Measures	Hazard Prevention Measures	Failure Analysis Required (Y/N)	Failure Analysis Results	Failure Analysis Comments	Minimum Depth of cover at time of Pipeline Construction	Casing Type	Concrete Slabs on stake drains	Casing Pipe	Pipe Grade	Wall Thickness	Wall Thickness From	Wall Thickness To	Marker Posts in accordance with AS2885.1 Requirements	Buried Marker Tape	Pipeline Patrols	Liaison Activities	One Call Service or Operation	Risk Evaluation Required	Frequency (AS2885.1 Model)	Consequences (AS2885.1 Model)	Pipeline Risk	Considerations	Actions	Required by	Responsibility	Date Completed	Actions taken	Risk after all actions taken
19	External Interference - Installation of services by utilities (open cut), equipment striking the pipeline									Installation through road or properties.	**Threat - Installation of new service (Open cut)** Where - below ground pipeline Responsible – service provider/contractor to service supplier What happens – during service installation equipment strikes and dents, gouges. When - during service installation activities Equipment used - Backhoe, ditchwitch, excavator or trenching machine may also be used.	16	N	Equipment used in these installation would not penetration the pipeline therefore not credible.	Wall thickness Cover - sometimes	DBYD Liaison activities Marker Posts Marker Tape Pipeline Patrolling	N		Equipment used in these installation would not penetration the pipeline therefore not credible.													N														
20	External Interference - Installation of services by utilities (horizontal drilling), equipment striking the pipeline									After the area is developed.	**Threat - Installation of new service (Horizontal drilling)** Where - below ground pipeline Responsible – service provider/contractor to service supplier What happens – during of a service installation equipment strikes and dents, gouges, pierces the pipeline. When - during service installation activities Equipment used - Horizontal drilling machinery.	17	Y		Wall thickness	DBYD Liaison activities Marker Posts Marker Tape Pipeline Patrolling	Y	Threat - penetration of the pipeline by drilling equipment causes ignition and death/ serious injury to drill operator or sporter. (Pilot drill only 50mm max. hole) Design features - wall thickness. Failure mode - loss of wall thickness, pinhole, hole Failure dimensions - 0-3mm (pinhole), 3mm - 12mm (intermediate), 12mm - 50mm (Major) Location - station Escaping fluid - lighter than air natural gas Energy release rate - (Pinhole 3mm) 0.001 GJ/ s Radiation distances of 2m and 1m for 4.7kW/ m2 and 12.6kW/ m2 respectively, .(Intermediate 12mm) 0.012GJ/ s Radiation distances of 6m and 4m for 4.7kW/ m2 and 12.6kW/ m2 respectively, (Major 50mm) 0.215GJ/ s Radiation distances of 15m and 25m for 4.7kW/ m2 and 12.6kW/ m2 respectively. Environmental effects - N/ A																		Y	Hyp.	Cat	Int	See ALARP analysis	Undertake ALARP Analysis and implement any requirements from that analysis	Prior to Construction	APA	22/08/2014	ALARP assessment completed and documented as part of this assessment. Conclusion - Prevent or control the use of rippers and HDD over the pipeline easement in this Development - via Council Development specifications and liaison activities.	Intermediate and ALARP
21	External Interference - Installation of services by utilities (Vertical drilling (boring)), equipment striking the pipeline									Equipment is large enough to penetrate the pipeline. But only with pilot drill. This will give a maximum hole size of 50mm. Drilling would take place to greater than pipeline depth.	**Threat - Installation of new service (Vertical drilling) (for power pole etc.)** Where - below ground pipeline Responsible – service provider/contractor to service supplier What happens – during service installation equipment strikes and dents, gouges, or penetrates the pipeline. When - during service installation activities Equipment used - Vertical drilling machinery.	18	N	This threat is not credible as no lighting or power poles are to be placed within the pipeline easement.	Wall thickness	DBYD Liaison activities Marker Posts Marker Tape Pipeline Patrolling	N	Threat - penetration of the pipeline by drilling equipment causes ignition and death/ serious injury to drill operator or sporter. (Pilot drill only 50mm max. hole) Design features - wall thickness. Failure mode - loss of wall thickness, pinhole, hole Failure dimensions - 0-3mm (pinhole), 3mm - 12mm (intermediate), 12mm - 50mm (Major) Location - station Escaping fluid - lighter than air natural gas Energy release rate - (Pinhole 3mm) 0.001 GJ/ s Radiation distances of 2m and 1m for 4.7kW/ m2 and 12.6kW/ m2 respectively, .(Intermediate 12mm) 0.012GJ/ s Radiation distances of 6m and 4m for 4.7kW/ m2 and 12.6kW/ m2 respectively, (Major 50mm) 0.215GJ/ s Radiation distances of 15m and 25m for 4.7kW/ m2 and 12.6kW/ m2 respectively. Environmental effects - N/ A	Failure analysis carried out for completeness for this threat																N				Should these poles be required in the pipeline easement at some time the use wide base supports for power poles to eliminate this threat as any excavation will not be re pipeline depth.	Vertical drilling in the pipeline easement is not permitted to occur during development. Council/developer to ensure that any plans for undertaking this construction method will not be permitted in easement area. Use of wide base supports will eliminate the need for this construction method.	During development planning and construction	Council/Developer			
22	External Interference - Installation of services by utilities (Vertical drilling (boring)), equipment striking the pipeline									Equipment is large enough to penetrate the pipeline. But only with pilot drill. This will give a maximum hole size of 50mm. Drilling would take place to greater than pipeline depth.	**Threat - Installation of new service (Vertical drilling) (for power pole etc.)** Where - below ground pipeline Responsible – service provider/contractor to service supplier What happens – during service installation equipment strikes and dents, gouges, or penetrates the pipeline. When - during service installation activities Equipment used - Vertical drilling machinery.	19	N	This threat is not credible as no lighting or power poles are to be placed within the pipeline easement.	Wall thickness	DBYD Liaison activities Marker Posts Marker Tape Pipeline Patrolling	N	Threat - penetration of the pipeline by drilling equipment causes supply issues. (Pilot drill only 50mm max. hole) Design features - wall thickness. Failure mode - loss of wall thickness, pinhole, hole Failure dimensions - 0-3mm (pinhole), 3mm - 12mm (intermediate), 12mm - 50mm (Major) Location - station Escaping fluid - lighter than air natural gas Energy release rate - (Pinhole 3mm) 0.001 GJ/ s Radiation distances of 2m and 1m for 4.7kW/ m2 and 12.6kW/ m2 respectively, .(Intermediate 12mm) 0.012GJ/ s Radiation distances of 6m and 4m for 4.7kW/ m2 and 12.6kW/ m2 respectively, (Major 50mm) 0.215GJ/ s Radiation distances of 15m and 25m for 4.7kW/ m2 and 12.6kW/ m2 respectively. Environmental effects - N/ A	Failure analysis carried out for completeness for this threat																N				Should these poles be required in the pipeline easement at some time the use wide base supports for power poles to eliminate this threat as any excavation will not be re pipeline depth.	Vertical drilling in the pipeline easement is not permitted to occur during development. Council/developer to ensure that any plans for undertaking this construction method will not be permitted in easement area. Use of wide base supports will eliminate the need for this construction method.	During development planning and construction	Council/Developer			
23	External Interference - Deep ripping, Agricultural activities										**Threat - Excavation, ploughing, post hole digging from vineyard/olive farm development or other Agricultural activities.** Where - underground pipeline Responsible - landowner What happens - agricultural activities cause pipeline to be struck by mechanical equipment. When - indeterminate Equipment used - dozer with ripper capable of ripping to 1.2m and rupturing pipeline. Backhoe, ditch witch, and excavator, post hole digger, or plough may also be used.	20	N	This threat will not be credible due to this area changing to an urban nature.			N														N																
24	External Interference - Deep ripping for Construction activities										**Threat - Deep ripping during construction activities.** Where - underground pipeline Responsible - Developer What happens – ripping equipment strikes pipeline. When - indeterminate Equipment used - dozer with ripper capable of ripping to 1.2m and rupturing pipeline.	21	N	Rippers will not be used in this areas of the pipeline during construction activities.			N														N																
25	Drainage										**Threat - Drainage problems causing erosion** Where - entire development site Responsible – development What happens - Erosion of pipe cover When - indeterminate Equipment used - site equipment	22	N	Fully developed area with drainage.	Wall thickness Depth of burial	Ground topology Liaison activities Pipeline Patrolling	N	Threat - erosion of the pipeline cover exposing the pipeline and causing coating damage. Possible corrosion. Design features - heavy wall pipe Failure mode - pinhole, hole Failure dimensions - 0-3mm (pinhole), 3mm - 12mm (intermediate) Location - pipeline Escaping fluid - lighter than air natural gas Energy release rate - (Pinhole 3mm) 0.001 GJ/ s Radiation distances of 2m and 1m for 4.7kW/ m2 and 12.6kW/ m2 respectively, (Intermediate 12mm) 0.012GJ/ s Radiation distances of 6m and 4m for 4.7kW/ m2 and 12.6kW/ m2 respectively. Environmental effects - short term environmental effects.	Failure analysis carried out for completeness for this threat																N																		
26	External Interference - Vibration										**Threat - Vibration** Where - at below ground pipework Responsible - third party What happens - vibration equipment causes stress on buried pipeline and possible failure. When - indeterminate Equipment used - N/A	23	N	This threat is not credible at areas other than road crossings during construction.	Procedure Registered Easement DBYD Liaison Activities.	Emergency response 24 hr SCADA Monitoring	N														N																
27	External Interference - Pile Driving										**Threat - Pile driving** Where - at below ground pipework Responsible - third party What happens – pile is driven into the underground pipeline. When - indeterminate Equipment used - N/A	24	N	No areas of this development will require pile driving therefore this is not a credible threat to the pipeline.	Wall thickness	Marker Posts DBYD Liaison activities	N														N																
28																																											
29	**Non Location Specific Threats**																																											
30	External interference for T1 area on 450mm Morwell to Dandenong pipeline. After Development Activities have been completed.									Following construction activities the equipment used in this developed site would likely to be no larger than a 127 excavator. Use of large equipment with rippers attached, Horizontal Directional Drilling and Horizontal Borers is highly unlikely to occur in the pipeline easement following construction activities. DBYD, Liaison activities and other procedural protections should ensure this threat does not occur post construction. The pipeline will not be located in privately owned land.	**Threat - External Interference with pipeline following Development of Casey Central PDP (excluding roads)** Where - below ground pipeline at cycle tracks/sports centres/other areas. Responsible – landowner/council What happens – during normal activities (landowner/council) excavates and strikes the pipeline. When - during construction activities Equipment used - possibly 30 to 35T Excavators with Tiger Teeth/Penetration Teeth.	25	Y		Depth of cover Wall thickness	DBYD Liaison activities Marker Posts Marker Tape Pipeline Patrolling	N		Failure analysis not required with protection measures in place.												N																		

Item		Land Classification								Threat Identification					Pipeline Protection		Failure Analysis			Physical and Procedural Protection Measures												Risk Evaluation					Actions				Risk Management	
																																							Actions taken following final report for Risk Assessment.	
Item	Feature	Measurement Length (m)	Pottery Land Classification - Design	From Chainage	To Chainage	Secondary Land Classification Review	From Chainage2	To Chainage2	Area Description / Land use	General Comment	Threats	Threat ID	Credible Risk (Y/N)	Reasons why threat is not a credible risk	Pipeline Protection Measures	Hazard Prevention Measures	Failure Analysis Required (Y/N)	Failure Analysis Results	Failure Analysis Comments	Minimum Depth of cover at time of Pipeline Construction	Coating Type	Concrete Slabs on stable debris	Casing Pipe	Pipe Grade	Wall Thickness	Wall Thickness From	Wall Thickness To	Marker Posts in accordance with AS2885.1 Requirements	Buried Marker Tape	Pipeline Patrols	Liaison Activities	One Call Service in Operation	Risk Evaluation Required	Frequency (AS2885.1 Model)	Consequences (AS2885.1 Model)	Pipeline Risk	Considerations	Actions	Required by	Responsibility	Date Completed	Actions taken	Risk after all actions taken
31	General Risk Category - Natural Threats										**Threat - Frost heave causing freezing of pipeline below steel specification** Where – underground pipeline Responsible – natural event What happens – due to freezing of ground at pipeline level the pipeline steel temperature is below specification and pipe may be subject to brittle failure. When – indeterminate Equipment used – short term environmental damage.	26	N	Not a credible risk to the pipeline as the ground does not become permanently frozen in Australia.	Design criteria	Patrols Special surveys	N															N										
32	General Risk Category - Natural Threats										**Threat - Pipeline settlement (dents)** Where – pipeline Responsible – natural event What happens - due to ground and pipeline settlement the pipeline is deformed. When – indeterminate Equipment used – N/A	27	N	Pipeline padding during construction will prevent this threat from occuring.	Design criteria		N															N										
33	General Risk Category - Mechanical Failure										**Threat - Pipeline material failure** Where – below ground pipework Responsible – mechanical failure What happens – pipeline failure due to material failure When – indeterminate Equipment used – N/A	28	N	Pipeline have been in operation for a considerable time and have been hydrostatically tested. This threat was thought to be not credible.	Quality control Material specifications Hydrotest 100% radiography	Material inspection Design criteria Acceptance testing Emergency response 24 hr SCADA Monitoring	N															N										
34	General Risk Category - Mechanical Failure										**Threat - Poor backfill causes mechanical damage to pipeline** Where – below ground pipework Responsible – construction contractor/inspection. What happens – pipeline failure due to mechanical damage caused by poor backfill When – indeterminate Equipment used – N/A	29	N	Not considered credible due to construction standards.	Quality control Material specifications Automatic line break valves	Coating survey Emergency response 24 hr SCADA Monitoring	N															N										
35	General Risk Category - Electricity										**Threat - Ensure no parallel Power lines to the pipeline easement are planned for the development** Where – below ground pipework Responsible - developer/power authority. What happens - pipeline failure due to corrosion damage caused by parallel power lines When – indeterminate Equipment used – N/A	30	TBC				TBC															TBC					Further information on the location of power lines is required in order to determine if this threat is credible or not.	Prior to construction	Developer/APA			