



APPENDIX L

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Appendix E. Risk Analysis

E.1 Options 1 & 2 High and medium risk assessment

Table E.1: High and medium risk assessment for Option 1 and Option 2

Risk ID#	Risk Area	Base case	Option#1	Option#2	Triggers	Consequences	Option 1				Option 2			
							Risk Level	Controls / Mitigation Measures	Control Effectiveness	Residual Risk Level	Risk Level	Controls / Mitigation Measures	Control Effectiveness	Residual Risk Level
28	Strategic context	N/A	Option doesn't future proof Townsville's water supply	Option doesn't future proof Townsville's water supply	Completion of base case	Additional water security benefits may not be realised in spite of capital expenditure	Extreme	No controls will mitigate the risks	Ineffective	Extreme	Extreme	No controls will mitigate the risks	Ineffective	Extreme
11	Environmental Issues	N/A	Offsite disposal of trench spoil Included in the base estimate. Covered under inherent risk ranging	Offsite disposal of trench spoil	Stage 2 pipeline installed subsurface and excavated material not used to backfill trench	Disposal of significant quantities of spoil required offsite as corridor width to narrow to permanently store in Stage 2 pipeline easement	High	Build pipeline above ground or if not practical use current Stage 1 strategy - make it the responsibility of Stage 2 construction contractors to dispose of spoil material to an appropriate site/method	Adequate	High	High	As for Option 1	Adequate	High
1	Approvals	Regulatory approvals are obtained e.g. vegetation clearing, works in waterways. Required approvals have been obtained.	Additional regulatory approvals required e.g. vegetation clearing, works in waterways, works in road corridors.require new approvals. May need to obtain these approvals within a short timeframe. Groundtruthing required before some applications can be lodged	Same as for Option #1	Project design, need for groundtruthing of project corridor to inform applications	Delay to project schedule due to timeframes required to obtain approvals	High	Confirm all required approvals as part of design refinement. Conduct groundtruthing as required to support the required applications and lodge applications as soon as possible. Option#1 is more time critical.	Adequate	Medium	Medium	Confirm all required approvals as part of design refinement. Conduct groundtruthing as required to support the required applications and lodge applications as soon as possible. Option#2 is less time critical.	Adequate	Medium
2	Approvals	Project is referred for determination under the Environment, Protection and Biodiversity Act 1999. Project determined to	Referral of project for determination under the Environment, Protection and Biodiversity Act 1999 recommended.	Same as for Option #1	Project design, need for groundtruthing of project corridor to inform referral. Referral may take in the order of 2-4 months to be decided by the Department of Environment and Energy.	Delay to project schedule due to timeframe required to obtain decision.	High	Conduct groundtruthing to inform the EPBC Act referral as soon as possible to enable the referral to be made as quickly as possible.	Adequate	Medium	Medium	Conduct groundtruthing to inform the EPBC Act referral as soon as possible to enable the referral to be made as quickly as possible.	Adequate	Medium

		not be a controlled action.						Option#1 is more time critical.					Option#2 is less time critical.		
9	Cultural Heritage	Management of cultural heritage in project corridor. Cultural Heritage Management Agreement executed.	Management of cultural heritage in project corridor. New Cultural Heritage Management Agreement required between the Bindal #2 applicant and the project proponent before project commences Option#1 is more time critical	Same as for Option #1		Time required to engage with the Traditional Owners and execute a Cultural Heritage Management Agreement for the project	Delay to project schedule due to timeframe required to execute the Cultural Heritage Management Agreement and comply with requirements relating to pre-construction survey	High	Consult Bindal#2 applicant during DBC Post-DBC: Continue to engage with the Bindal #2 applicant in relation to the project. Action the execution of a Cultural Heritage Management Agreement as soon as possible.	Adequate	Medium	Medium	Consult Bindal#2 applicant during DBC Post-DBC: Continue to engage with the Bindal #2 applicant in relation to the project. Action the execution of a Cultural Heritage Management Agreement as soon as possible.	Adequate	Medium
31	Technical	Construction phase - Extreme weather events e.g. Flooding	Same - construction risk is greater for pipelines	Sama as Option#1		Cyclones, intense rain storms, storm surges with king tides, or periods of prolonged rainfall	Delay and/or damage to construction works	High	Undertake construction works only within periods of the year likely to not be affected by extreme weather events; in tender set out requirement for emergency action plan to deal with and limit damage to construction works by contractor	Adequate	Medium	High	Undertake construction works only within periods of the year likely to not be affected by extreme weather events; in tender set out requirement for emergency action plan to deal with and limit damage to construction works by contractor	Adequate	Medium
33	Technical	Not applicable	Contractual formation - how many contract packages. More packages than what is optimal for delivery. Expected laying rates slower than anticipated	Contractual - how many contract packages. More packages than what is optimal for delivery. Expected Laying rates slower than anticipated.		Need to provide local contractors opportunities - Client decision; commercial market conditions at the time of tendering; economics of scale in splitting up package scopes; setting non-realistic laying rates in Stage 2 contracts; poor weather; letting contracts to inappropriate contractors; limited local pool	Not a competitive tender bidding situation could develop; cost of tender bids may be higher than funding available; to many contracts may lead to delays due to interface issues; delays in construction could lead to significant time and cost overruns	High	Use existing Stage 1 contractors has a VO to their works; set realistic laying rates/construction programs based on expected difficult ground conditions & possible weather delays; stage construction over dry month campaigns only; only let contracts to proven contractors, but in tender set out the amount of local content partners required Accept the risk	Adequate	Medium	High	Use existing Stage 1 contractors has a VO to their works; set realistic laying rates/construction programs based on expected difficult ground conditions & possible weather delays; stage construction over dry month campaigns only; only let contracts to proven contractors, but in tender set out the amount of local content partners required Accept the risk	Adequate	Medium
34	Technical	Not applicable	Ground condition - temp works issues and variable ground materials.	Ground condition - temp works issues and		Will be triggered at any point of the year during pipeline construction, but worse in wet season	Delays to construction and possible cost overruns	High	Build pipeline above ground Stage sections of	Adequate	Medium	High	Build pipeline above ground Stage sections of	Adequate	Medium

				variable ground materials.				works (programming of works) to dry month construction campaigns only - may take a few seasons to complete scope of works; In cost estimates use worse case of dewatering and shoring support for trench for majority of pipeline alignment construction				works (programming of works) to dry month construction campaigns only - may take a few seasons to complete scope of works; In cost estimates use worse case of dewatering and shoring support for trench for majority of pipeline alignment construction		
41	Environmental Issues	Not applicable	Trench spoil has Acid Sulphate Soil characteristics	Same as for Option #1	Stage 2 pipeline excavated material found to be ASS	If spoil not used for trench backfill or if to be spoiled offsite may require lime dosing	High	Undertake additional relevant fieldwork and associated laboratory testing to confirm PASS or not during DBC and main construction contract. If found to be present then make provision for lime dosing spoil material before either reuse or spoil offsite.	Adequate	Medium	High	As for Option 1	Adequate	Medium
43	Technical	Not Applicable	Aggressive soil and/or groundwater encountered which may adversely effect buried steel pipeline and/or concrete and reinforcement	Same as for Option #1	Aggressive ground conditions encountered during Stage 2 pipeline investigations/construction	Durability issues for steel pipeline and structural foundations	High	Undertake additional relevant fieldwork and associated laboratory testing to confirm aggressive ground conditions or not during DBC and main construction contract. If found to be present then make provision for increased cover for buried reinforcement, special concrete mixes and sacrificial steel layers or cathodic protection	Adequate	Medium	High	Undertake additional relevant fieldwork and associated laboratory testing to confirm aggressive ground conditions or not during DBC and main construction contract. If found to be present then make provision for increased cover for buried reinforcement, special concrete mixes and sacrificial steel layers or cathodic protection	Adequate	Medium
10	Approvals	N/A	Native Title not fully extinguished in project area and Indigenous Land Use Agreement is required	Same as for Option #1	Time required to engage with the Traditional Owners and Aboriginal Land Council to execute an Indigenous Land Use Agreement.	Delay to project schedule due to timeframe required to execute the Indigenous Land Use Agreement.	High	Consult Bindal#2 applicant during DBC Post-DBC: Continue to engage with the Bindal #2 applicant and aboriginal land council to prepare and execute Indigenous Land Use Agreement.	Adequate	Low	Medium	Consult Bindal#2 applicant during DBC Post-DBC: Continue to engage with the Bindal #2 applicant and aboriginal land council to prepare and execute Indigenous Land Use Agreement.	Adequate	Low

26	Stakeholder engagement	Upgrading the channel won't provide the jobs and support economic growth as well as other options.	Not an issue	Same in short term. Not an issue in the long term.	Option#2 Not proceeding with Option#1	Community not satisfied Political implications	#N/A			#N/A	High	Accept the risk	Adequate	High
4	Approvals	N/A	Approval to undertake works within road reserves (State and local government controlled) - Part of the estimate. Included under Inherent Risks for contingency	Same as for Option #1	Finalisation of pipeline alignment & proof of requiring to traverse roads. Secure approval in timely manner.	Disruption to road network during construction and increase maintenance during Stage 2 operational phase	Medium	Identify who is responsible for roads (Burdekin Shire Council/DTMR); engage with responsible entity, confirm road usage (types and volumes) including seasonal traffic trends; design subsurface trenchless installation deep enough not to detrimentally affect road or if not practical design trenching at the right time of year to minimise disruption and undertake in a staged manner at night to minimise impacts on local network; change backfilling design for more robust approach to limit any future settlement issues that could require more than usual road maintenance	Adequate	Medium	Medium	Identify who is responsible for roads (Burdekin Shire Council/DTMR); engage with responsible entity, confirm road usage (types and volumes) including seasonal traffic trends; design subsurface trenchless installation deep enough not to detrimentally affect road or if not practical design trenching at the right time of year to minimise disruption and undertake in a staged manner at night to minimise impacts on local network; change backfilling design for more robust approach to limit any future settlement issues that could require more than usual road maintenance	Adequate	Medium
12	Environmental Issues	N/A	Dewatered treatment reuse or disposal	Dewatered treatment reuse or disposal	Stage 2 pipeline trench excavations require dewatering due to high groundwater table over much of alignment	Dewatered volumes may have high sediment load and require treatment before being discharged into existing natural drainage system	Medium	Build pipeline above ground, but if not practical, pump dewatered volumes into temporary turkey nests or ponds for desilting and then discharge into natural drainage	Adequate	Medium	Medium	Build pipeline above ground, but if not practical, pump dewatered volumes into temporary turkey nests or ponds for desilting and then discharge into natural drainage	Adequate	Medium
21	Political context	N/A	Perceived benefits of delivering option 1 at the same time as base case are lost due to the delays.	Less risk compared to Option#1 - staged.	Delays in government decisions around Option#1 and approvals	Community not satisfied Political implications	Medium	Progress with Option#1 as per DBC	Adequate	Medium	Low		Adequate	Medium

42	Land access	N/A	Option might require establishment of an easement over the land containing the pipeline, associated infrastructure and access roads	Option might require establishment of an easement over the land containing the pipeline, associated infrastructure and access roads		Impacted land may be a freehold, leasehold and reserve land. One or more land/lease holders may not grant required easement or the negotiations may be protracted.	Opposition and project delay	Medium	Engagement with the land / lease holders to access the land for preliminary investigations during the DBC phase Post-DBC, engage with landholders to commence the dialogue for establishing the easement. Detailed land valuations of the impacted land to be completed	Adequate	Medium		Medium	Engagement with the land / lease holders to access the land for preliminary investigations during the DBC phase Post-DBC, engage with landholders to commence the dialogue for establishing the easement. Detailed land valuations of the impacted land to be completed	Adequate	Medium
45	Technical	Not Applicable	Cathodic protection for steel pipeline within the vicinity of the existing major OH powerline	Same as for Option #1		Pipeline crossing close to the existing OH	Induced electronic currents Health and Safety issues	Medium	Add cathodic protection Accept the risk	Adequate	Medium		Medium	Add cathodic protection Accept the risk	Adequate	Medium

E.2 Options 1 & 2 Risk Quantification

Table B1: Risk quantification for Options#1 and Option#2

Risk ID#	Risk Area	Base case	Option#1	Option#2	Option#1				Option#2			
					Likelihood	Minimum	Most Likely	Maximum	Likelihood	Minimum	Most Likely	Maximum
31	Technical	Construction phase - Extreme weather events e.g. Flooding	Same - construction risk is greater for pipelines	Same as Option#1	50%	\$ -	\$ 100,000	\$ 200,000	50%	\$ -	\$ 100,000	\$ 200,000
33	Technical	Not applicable	Contractual formation - how many contract packages. More packages than what is optimal for delivery. Expected laying rates slower than anticipated	Contractual - how many contract packages. More packages than what is optimal for delivery. Expected Laying rates slower than anticipated.	50%	-\$ 4,250,000	\$ -	\$ 8,500,000	65%	\$ -	\$ -	\$10,000,000
34	Technical	Not applicable	Ground condition - temp works issues and variable ground materials.	Ground condition - temp works issues and variable ground materials.	50%	-\$ 5,000,000	\$ -	\$ 5,000,000	50%	-\$ 5,000,000	\$ -	\$ 5,000,000
43	Technical	Not Applicable	Aggressive soil and/or groundwater encountered which may adversely effect buried steel pipeline and/or concrete and reinforcement	Same as for Option #1	25%	\$ 1,134,000	\$ 2,016,000	\$ 3,150,000	25%	\$ 1,134,000	\$ 2,016,000	\$ 3,150,000
10	Approvals	N/A	Native Title not fully extinguished in project area and Indigenous Land Use Agreement is required	Same as for Option #1	25%	\$ -	\$ -	\$ 1,000,000	10%	\$ -	\$ -	\$ 1,000,000
12	Environmental Issues	N/A	Dewatered treatment reuse or disposal	Dewatered treatment reuse or disposal	50%	\$ -	\$ 100,000	\$ 300,000	50%	\$ -	\$ 100,000	\$ 300,000
45	Technical	Not Applicable	Cathodic protection for steel pipeline within the vicinity of the existing major OH powerline	Same as for Option #1	50%	\$ 400,000	\$ 500,000	\$ 600,000	50%	\$ 400,000	\$ 500,000	\$ 600,000
5	Approvals	N/A	Impact on cane railway lines. Will require approvals to conduct works	Impact on cane railway lines. Will require approvals to conduct works	25%	\$ 50,000	\$ 100,000	\$ 200,000	25%	\$ 50,000	\$ 100,000	\$ 200,000
7	Approvals	Not applicable	Impact on channel integrity and operation during and after construction and crossings	Same as for Option #1	50%	\$ -	\$ 10,000	\$ 50,000	50%	\$ -	\$ 10,000	\$ 50,000
35	Technical	Not applicable	Type of pipe material used. Political issues. Supply and lead in time. Cost equalization, thrust block and flotation control - Opportunity	Type of pipe material used. Political issues. Supply and lead in time. Cost equalization, thrust block and flotation control - Opportunity	20%	-\$ 8,000,000	\$ -	\$ 4,000,000	20%	-\$ 8,000,000	\$ -	\$ 4,000,000
44	Technical	Not Applicable	Foundation for structures required to be extended or foundation type needed to be changed during construction contract	Same as for Option #1	25%	\$ 2,000,000	\$ 3,000,000	\$ 4,000,000	25%	\$ 2,000,000	\$ 3,000,000	\$ 4,000,000

37	Technical	Not applicable	Stage 1 pipeline has been designed on a pressure associated with the base case. Increased pressure with Stage-2. May need an additional pump station due to pressure.	N/A		50%	\$ -	\$ -	\$ 2,500,000				
40	Technical	Not applicable	Unknown buried electrical services could effect underground cable runs	Unknown buried electrical services could effect underground cable runs		25%	\$ -	\$ -	\$ 500,000	20%	\$ -	\$ -	\$ 500,000

E.3 Option 3 High and medium risk assessment

Table C1: Risk assessment for Option 3

Risk Area	Base case	Option#1		Triggers	Consequences	Option 3			
						Risk Level	Controls / Mitigation Measures	Control Effectiveness	Residual Risk Level
Funding	N/A	Ability to recover required revenue under new tariff		Implementation of new tariff structure	Revenue shortfalls	Medium	Undertake detailed modelling on potential funding implications and make provisions	Adequate	Medium
Stakeholder engagement	N/A	Disproportionate impact on disadvantaged groups due to consumption-based tariff		Implementation of new tariff structure	Reputational and hardship impact	Medium	Undertake assessment of impact on vulnerable and consider rebates/support	Adequate	Low