

Project Risk Register – Raod Link section

1. Purpose

The data gathered through the risk workshops (identification, quantification and review) was documented in this Project risk register.

The notes in the “Allowance/Mitigation” column italicised reflect the comments included in the JHDL-JV cost estimate report reflecting the approach/amount of risk included in the cost estimate for the Raod Link section.

2. Categories

Category	Description
Planning & Engineering	
Site	Risks associated with all aspects of the site preparation / utilisation and land acquisition influencing the timing or scope of the Project as currently conceived.
Design & Construction	Technical and engineering / design risks related to the anticipated level of complexity in developing detailed specification/design and in construction of assets.
Operations & Maintenance	Risks associated with uncertainty to cost of maintenance or difficulty in operation during the life of the Project.
Commercial & Legal	
Commercial	Risks related to the capability and capacity of the market and Project team to manage and deliver the Project.
Legal	Risks that influence the legal ability to deliver the assets and the services.
Community	
Stakeholders	Risks associated with organisations, groups or individuals that are not contracted parties to the Project but which are affected by or can influence Project outcomes.
Revenue (to be determined outside of this risk valuation process)	
Toll revenue	Risks associated with the accuracy of traffic forecasts and toll revenues

Legend

	Risk covered during the risk valuation process
	Risk addressed outside of risk valuation process (e.g. included in JHDL- JV cost estimate)

3. Project Risk Register

No	Risk	Description	Consequence	Allowance / Mitigation	Likelihood (%)	Impact (\$)
Planning & Engineering						
Site						
1.	Unforeseen site conditions					
1.1.	Contamination	<p>Risk that during the construction phase unforeseen contamination or hazardous materials are identified or occur on site and these require remediation.</p> <p>Petrol stations along the alignment. Potential buried unexploded ordnates and underground tunnels in Royal Park Migration of contaminated water into water supply</p>	<p>Delay to work completion Unexpected remediation or rectification costs</p>	<p>Management of the contaminated soils in order to keep them capped and contain the impact Geotechnical program will help understand the water regime Allowance for contamination in the Coode Island Silt area where the connection to CityLink is likely to be implemented. <i>"Exclusions from the construction cost estimates include contamination and remediation of the site" (2.2)</i> <i>Assumption that "There is no major impact to tunnelling operations from obstructions, geological, water or contaminants" (2.3)</i></p>	20%	<p>Best: \$10m Likely: \$20m Worst: \$30m</p>
1.2.	Ground condition	<p>Risk that poor or partly complete knowledge of ground conditions during planning and design, uncertainty associated with complex ground conditions, unforeseen ground conditions during construction, limited experience of consultant / contractor with materials has an impact on the cost and time to complete construction (e.g. TBM not adequately calibrated or undersized could lead to tunnelling taking a longer time than anticipated).</p> <p>East of Lygon Street is basalt, which might not be deep enough to deal with full tunnel. Deep leads in the area. West of Lygon Street is Melbourne formation with various grades, which could cause Tunnel Boring Machine (TBM) to get jammed if worse than average. Noting that Melbourne formation varies significantly, some may require blasting.</p>	<p>Delay to work completion Unexpected remediation or rectification costs</p>	<p>In preparing the design, the JHDL-JV have worked on the assumption that east of Lygon st is basalt which is of sufficient depth to get the whole tunnel cross section and west of Lygon St is Melbourne formation which is likely to be easier tunnelling due to lower strength required. Bore holes will help identify if the basalt is deep enough. Machine specification will deal with all the ground conditions along the alignment. <i>Assumption that "There is no major impact to tunnelling operations from obstructions, geological, water or contaminants" (2.3)</i></p>	10%	<p>Best: \$30m Likely: \$60m Worst: \$90m</p>
2.	Land and property					
2.1.	Land acquisition programme	<p>Land designation delayed, declined or inadequate, construction extends outside designation, property acquisition delayed. Likely to be greatest risk in areas where the tunnel goes in and out and where cut and cover or elevated structures are being built since issues are less likely for the tunnel.</p> <p>Extra piece of land could be required (e.g. for offset around connections to the existing road network). Land owners could refuse to leave</p>	<p>Delay to work commencement Additional compensation to be paid Additional design costs</p>	<p>Further studies during business case / planning phase will assist in identifying requirements <i>"No cost allowance for purchase or demolition of any improvements to ground level has been included" (2.1)</i></p>	50%	<p>Best: \$0m Likely: \$50m Worst: \$100m</p> <p>An additional allowance of \$50m was included in the PSC.</p>

No	Risk	Description	Consequence	Allowance / Mitigation	Likelihood (%)	Impact (\$)
2.2.	Site access	<p>Delay in obtaining land access agreements or land access agreement conditions breached. The Project will require lay down areas and access points.</p> <p>Lack of appreciation of the size and scale of the equipment that is required to build this job</p> <p>Crown / Government ownership of land for identified alignment could be needed.</p> <p>Inadequate temporary access to construction site and lay down areas (e.g. as a result of heavy traffic on road network).</p> <p>Transportation of material and equipment could have to be undertaken during off peak time, which could mean that more vehicles would be used less efficiently to perform construction work.</p> <p>Working hours (e.g. near hospital) could limit site access.</p> <p>Site may require additional point of access.</p> <p>End of Eastern Freeway and connection with CityLink will require adequate access (which is already considered "tight")</p> <p>Current pricing assumed free access into Royal Park would be granted.</p> <p>Current pricing assumed unfettered access to CityLink (i.e. no tolling), but a deal would need to be negotiated between the State and Transurban.</p> <p>Gas and fuel site and other crown land areas would need to be secured. Gas and fuel site currently leased to the City of Yarra.</p>	<p>Delay to work completion</p> <p>Interruption of operations</p> <p>Additional compensation to be paid</p> <p>Additional construction costs</p> <p>Additional operation costs</p>	<p>State has rights under the concession deed with CityLink to access the site, though a new deal will arguably be needed).</p> <p>Conservative assumption about the size of the TBM (e.g. very large)</p> <p>Assumption is that the sections of TBM will be precast off-site.</p> <p><i>Assumption that "All site areas are available within 6 months of any contract award" (2.3)</i></p> <p><i>Assumption that "There is no limitation to the number of construction vehicle movements to/from site. (2.3)</i></p> <p><i>"All land (including temporary sites) are provided by LMA at no cost" (2.3)</i></p> <p><i>Assumption that "Free access is assumed to CityLink controlled site areas"</i></p> <p><i>"An allowance to provide for the impact of reduced working hours and restricted access conditions was also determined by reference to current experience" (Bridges 2.4.2)</i></p>	20%	<p>Best: \$30m</p> <p>Likely: \$60m</p> <p>Worst: \$90m</p>
3.	Physical interface with existing infrastructure					
3.1.	Transportation network	<p>Unforeseen complexity in the integration of adjacent roads and freeways,</p> <p>Limited site flexibility.</p> <p>Un-cooperative concessionaires.</p> <p>Interface with existing infrastructure, in particular CityLink, more complex or different to that anticipated.</p> <p>Shutdown of a rail line (e.g. Clifton Hill line, Upfield line) leading to MAE claims by Metro or Yarra Trams.</p> <p>Working hours could be more restricted to prevent interruption of traffic on CityLink, which would create a limited "window of opportunity" that could lead to full days of work lost if an unexpected event happens (e.g. a truck breaks on a way to a delivery).</p> <p>Engagement and dealing with VicRoads will be required for local roads and streets.</p> <p>Congestion could be worse than expected (less efficient transport movements) and capacity (including new movements for Project) could be limited causing delays</p>	<p>Delay to work commencement</p> <p>Delay in work completion</p> <p>Additional construction costs</p> <p>Additional design costs</p> <p>Unexpected remediation or rectification costs</p> <p>Additional compensation to be paid</p>	<p>New rail franchising agreement will assist in access arrangement.</p> <p><i>"No allowance for any costs that may be payable to CityLink" (2.2)</i></p> <p><i>"No allowance for major railway reconfigurations. Allowance has been made for minor works to provide space for the viaduct piers where crossing existing rail" (2.2)</i></p>	50%	<p>Best: \$10m</p> <p>Likely: \$25m</p> <p>Worst: \$50m</p>
3.2.	Public services and utilities	<p>Risk that construction activities disrupt delivery of core public services (e.g. water, electricity, telephone). Predominately incident based (e.g. crane toppling over and taking out a power line).</p> <p>Relocation of utilities takes longer than anticipated or is more expensive.</p> <p>High volume of diversions and risk that cost of diversions is higher than expected.</p> <p>Un-cooperative utility companies or dispute over cost-sharing.</p> <p>Utility relocations (e.g. significant sewers in this area)</p> <p>Alexandra Parade substations</p>	<p>Delay in work completion</p> <p>Unexpected remediation or rectification costs</p> <p>Additional compensation to be paid</p>	<p>Early dialogue with service providers in order to obtain detailed knowledge of where major utilities are located.</p> <p>It is possible to adjustments to pier locations to avoid public services.</p> <p><i>"Impacts on the wider project of approval and third party interactions such as utilities, stakeholders, etc have been assumed to be included in the whole of project modelling" (2.1)</i></p>	50%	<p>Best: \$0m</p> <p>Likely: \$5m</p> <p>Worst: \$15m</p>
4.	Traffic management	<p>Risk that transport access to the surrounding suburbs is inadequate due to ineffective traffic management.</p> <p>Delays in required temporary works / diversions.</p> <p>Traffic modelling has not been factored into the design, which could lead to elements of the project having to be redesigned.</p>	<p>Delay in work completion</p> <p>Unexpected remediation or rectification costs</p> <p>Unforeseen State management costs</p>	<p><i>"General traffic management works are included within the estimates" (2.1)</i></p> <p><i>Assumption that "Adjacent traffic can be restricted to 40kph speed limits where required" (2.3)</i></p>		[Risk already priced in cost estimate]
5.	Working hours	<p>Working hours are limited in order to limit public nuisance to adjacent residents.</p> <p>Larger residential</p> <p>Proximity of Royal Children's Hospital may also impact available working hours.</p>	<p>Delay to work completion</p> <p>Unexpected remediation or rectification costs</p>	<p><i>"An allowance to provide for the impact of reduced working hours and restricted access conditions was also determined by reference to current experience" (Bridges 2.4.2)</i></p>		[Risk already priced in cost estimate]
Design & Construction						

No	Risk	Description	Consequence	Allowance / Mitigation	Likelihood (%)	Impact (\$)
1.	Design issues	Unforeseen complexity associated with the design (e.g. material properties inappropriate). Uncertainty about how the traffic will flow (e.g. lane layout). More work required to demonstrate that the design will work on a traffic flow basis, which could lead to elements of the Project being redesigned, including ramps design (e.g. at Elliot Avenue) which would require larger areas. Potential bridging over Moonee Ponds Creek could have impacts on the designated flood management areas. Water supply to cope with fire system demands Ventilation and smoke management facilities could be inadequate. Depending on alignments, it may be required to amend design to deal with adjacency to power lines. Complexity with mechanical and electrical components, traffic management and control technology.	Additional design costs Delay to work completion	Resolving strategies with fire brigades and relevant authorities <i>Assumption that "Moonee Ponds Creek can be bridged. There are no afflux impacts (or costs) due to piling, etc. (2.3)</i>		[Risk already priced in cost estimate]
2.	Staging	Risk that complexity of integration of stages is underestimated. Bigger risk would be if the commencement of stage 2 was whilst stage 1 is being completed (and undertaken by different parties). Portions are separable, though this may create greater interface risk, particularly if there is an overlap on timing.	Additional design costs Additional construction costs	A stump would be required during Stage 1 to enable Stage 2 to be built.	50%	Best: \$10m Likely: \$20m Worst: \$50m
3.	Tunnel Boring Machine (TBM)	Currently only 2 manufacturers of TBM in the world. Risk of delays as the lead time is typically 14 months to design, build and get the machine to Australia. Risk of price being higher than expected. Replacement of parts of the TBM in case of failure. TBM not performing at anticipated levels. Availability of power supply as the TBM will require significant amounts of high voltage electricity.	Delay in work completion Additional construction costs	Conservative assumptions on rate of advance per shift depending on the assumed type of ground Production rates take into account breakdowns. Warranties applicable to some extent.		[Risk already priced in cost estimate]
4.	Construction methodology	Risk that construction methodology (excluding TBM) causes delays or additional costs.	Delay in work completion Additional construction costs			[Risk already priced in cost estimate]
5.	Construction material	Risk that there is insufficient material (e.g. concrete, steel) produced locally to meet the requirements of construction activities.	Delay in work completion Additional construction costs			[Risk already priced in cost estimate]
6.	Spoil disposal	Current cost estimate for disposal of spoil is inadequate in terms of distance of travel required, cost of disposal and cost of travel (i.e. tolls not included in current estimates). - additional cost Most relevant to Road Link section given significant tunnelling components.	Delay in work completion Unexpected remediation or rectification costs Additional construction costs	<i>Assumption that "Spoil disposal sites are available within 50km of the site. Tip fees have been allowed (but not separate tip acquisition, development or management costs)" (2.3)</i>		[Risk already priced in cost estimate]
7.	Industrial relations and labour	Risk that contractor or site specific industrial relations events occur during construction Costing includes allowance based on today's rates. Shortage of skilled resources to build the Project in the area. Labour issues could arise depending on timing. Need to consider in particular Melbourne Metro but also NSW road and rail projects and resource related projects. Regional Rail Link industrial set ups will re-set the benchmark and will have an impact on pricing.	Delay to work completion Unexpected remediation or rectification costs	Prefabrication of tunnelling components will mitigate the risk. Costing based on Clem 7 – Potential for efficiency gain although offset by sheer volume requirement.	25%	Best: \$10m Likely: \$50m Worst: \$250m
8.	Market pricing	Risk that rates of escalation (e.g. power, labour, CPI, etc.) are underestimated. Other key pricing risks include steel products and concrete supply (capacity of local market might be an issue). Risk pricing and margins required could be higher in the context of recent cost "blowouts" (e.g. Desalination plant, Ararat prison, etc.)	Additional construction costs	DTF providing escalation factors for application to real dollar construction/operating costs. <i>"Impact from Carbon Tax is excluded" (2.2)</i>	10%	[Risk will be assessed through sensitivity testing in the financial analysis report]
9.	Contractual dispute	There may be a significant contractual dispute (or a series of disputes) during the construction phase (i.e. due to the technical complexity of the Project). Connection with Transurban is the biggest concern. Significant disputes on Desalination and Regional Rail Link could lead to a need to reset benchmarks.	Delay to work commencement Delay to work completion Additional construction costs		25%	Best: \$50m Likely: \$100m Worst: \$250m
10.	Contractor default	The contractor or its subcontractors may become insolvent during the construction period and be unable to complete the works. Risk of insolvency has increased in recent times (e.g. with the default of St Hilliers).	Delay to work completion Unexpected remediation or rectification costs	Mitigation possible through contracting strategies.	30%	Best: \$50m Likely: \$250m Worst: \$500m
11.	Safety incident	Safety incident during construction or poor public security leads to member of public or construction worker becoming injured. Safety incident would have an immediate downtime impact due to the need to get investigate however shut down would most likely be localised and work would continue on other components of the Project. Major delay could be caused by a shutdown of the site by WorkCover.	Delay in work completion Additional construction costs Additional insurance costs	Allowances for work practices are included in cost estimates		[Risk already priced in cost estimate]

No	Risk	Description	Consequence	Allowance / Mitigation	Likelihood (%)	Impact (\$)
12.	Adverse weather	Risk of inability to meet construction timetable as a result of adverse weather.	Delay to work completion Additional construction costs	"Allowance for construction programme delay (wet weather, etc.)" (2.1)		[Risk already priced in cost estimate]
13.	Force majeure	Risk of additional cost and/or delay caused by major force majeure events (e.g. surface subsidence) which prevent construction milestones being met and the total cost being different from anticipated.	Delay to work completion Interruption of operations Unexpected remediation or rectification costs	Contingency in the contract cost estimates for the numerous smaller excesses which may be incurred during construction.		[DTF advised that it is not required to quantify this risk]
14.	Insurance	Inadequate insurance or failure to procure insurance (e.g. for Force majeure risk) for the construction period. Major incident would increase insurance premiums	Additional insurance costs Delay to work completion Interruption of operations			[Risk already priced in cost estimate]
Operations & Maintenance						
1.	Latent defects	Risk that construction defects or poor quality construction are not detected in the construction period and could lead to premature deformation / failure. Inadequate quality assurance / control during construction.	Unexpected remediation or rectification costs Additional maintenance costs Additional lifecycle costs Interruption of operations		15%	Best: \$0m Likely: \$50m Worst: \$100m
2.	Maintenance and lifecycle costs	Risk of increased costs due to unforeseen changes in the operation or maintenance, including estimating risk (i.e. frequency or absolute costs)	Additional maintenance costs Additional lifecycle costs	"The costs exclude allowances for maintenance of toll equipment and toll room back office costs" (4)	20%	Per annum Best: \$3m Likely: \$6m Worst: \$15m
3.	Service specifications	Risk that the service specifications do not appropriately reflect the service requirements (e.g. toll collection systems, customer service environment)	Unexpected remediation or rectification costs			[Risk already priced in cost estimate]
4.	Utilities interruption	Risk that required utilities (e.g. electricity, water supply) are not available to the site as expected after construction completion.	Interruption of operations Unexpected remediation or rectification costs			[Risk already priced in cost estimate]
5.	Insurance	Inadequate insurance or failure to procure insurance (e.g. for Force majeure risk) for the operation phase. Major incident would increase insurance premiums	Additional insurance costs Delay to work completion Interruption of operations			[Risk already priced in cost estimate]
6.	Hand back	Risk that the condition of the asset at the end of the concession is inadequate. Renegotiation of the hand back conditions leading to a reduction of the requirements Contractual structure implemented to deal with hand back is inadequate (e.g. road audit process, verification of standards, etc)	Reduced asset life Unexpected remediation or rectification costs			[Risk already priced in cost estimate]
Commercial & Legal						
Commercial						
1.	Scope change	Key stakeholder/decision maker objectives are not clearly defined or are misaligned, leading to scope uncertainty, inadequate briefing of specifications or scope variations during procurement or implementation phase (e.g. PT initiatives could interfere with Project, late inclusion of City access could lead to incremental costs).	Additional design costs Additional construction costs Delay to work commencement Delay to work completion			An allowance of \$50m was included in the PSC.
2.	Commercial interface with road concessionaires (Transurban, ConnectEast).	Interoperability with ConnectEast and Transurban Concerns around Transurban being able to offer a combined material adverse effect (MAE) claim offset with bid – be it perceived or actual Risk of Transurban doing augmentation works in the Project corridor – physical structure may change from existing during bid process causing an impact on current design and/or detrimental impact on anticipated traffic flows. Competitive advantage of ConnectEast and Transurban	Delay to work commencement Delay in work completion Additional design costs Unexpected remediation or rectification costs Additional compensation to be paid	Industry norm in terms of interoperability – arrangements developed in terms of access to tag base and interoperability.		[Risk not quantifiable at this stage]
Legal						

No	Risk	Description	Consequence	Allowance / Mitigation	Likelihood (%)	Impact (\$)
1.	Planning & Approval process	Necessary approvals (e.g. EPBC, MTPFA, EPA), permits, enabling legislation or State / Federal licences (State and Federal) cannot be obtained within the legislative framework or are obtained subject to unanticipated conditions that have adverse cost consequence or cause delay in construction. Required planning scheme reservations and/or amendments for the design agreed at contractual close cannot be obtained or are delayed.	Delay to work commencement Delay to work completion Additional design costs	Approvals matrix will be required <i>"Impacts on the wider project of approval and third party interactions such as utilities, stakeholders, etc have been assumed to be included in the whole of project modelling" (2.1)</i>	30%	Best: \$0m Likely: \$20m Worst: \$100m
2.	Change in law	Planning, environmental, or other legislative or regulatory changes cause delay or increased cost during construction period or operating period.	Additional costs to comply with the changes Delay to work completion Interruption of operations			[Risk not quantifiable]
Community						
Stakeholders						
1.	Social unrest / Public objections / Community actions	Social unrest caused by Project impacts to groups / individuals. General public resistance to the Project implementation. Opposition to location of ventilation stack by residents. Negative impacts to adjacent residential/commercial properties. Negative impacts to adjacent public spaces (e.g. parks, zoo, cemetery).	Delay to work commencement Delay to work completion	Mitigation possible through planning and management. <i>"Impacts on the wider project of approval and third party interactions such as utilities, stakeholders, etc have been assumed to be included in the whole of project modelling" (2.1)</i> <i>Impact of Community and other stakeholder negotiations excluded (2.2)</i>		[Risk deemed immaterial]
2.	Cultural heritage / Native title	Risk that during site development an archaeological or cultural heritage artefact is discovered (i.e. pre or post settlement). Greater risk in the Raod Link section, though this area is a highly disturbed corridor. Given river crossing near Dights falls, artefacts could be found within 200m of the river is where communities have traditionally congregated. Melbourne cemetery will require a planning permit from Heritage Victoria. Cultural heritage issues include ANZAC Hall that would need to be relocated to enable the constructors to finalise the design. Risk that site(e.g. Yarra Bend Park) is constrained by native title and that approvals from local aboriginal groups are withheld. Claims unlikely given no continuous occupation and high urbanisation level.	Delay to work commencement Delay to work completion Unexpected remediation or rectification costs	Cultural heritage management plan would be required before commencement. Desktop investigations thus far have not identified any areas of concern. More comprehensive analysis to be undertaken. <i>"Impact of heritage items excluded" (2.2)</i>		[Risk deemed immaterial]
3.	Ecological	Risk that site is constrained by environmental / ecological issues (e.g. flora or fauna) Treatment and disposal of water from excavation.	Delay in work commencement Delay in work completion Additional design costs Additional construction costs	Flora and fauna in Royal Park and Yarra Bend Park will require a survey. <i>"General environmental works are included within the estimates" (2.1)</i>		[Risk deemed immaterial]