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1 Executive Summary

Throughout the Product Definition phase, a robust and systematic risk management process has remained central to the achievement of objectives.

In addition to the identification and management of project related risks and opportunities, risk-based techniques have been used to inform decisions such as those relating to infrastructure design development, patronage / demand forecasts as well as development of time and cost contingencies.

In accordance with the Australian and New Zealand Standard AS/NZS 4360:2004 “Risk Management”, risk management has been tailored to the specific needs of the project and thus incorporates a strong focus on whole-of-life outcomes.

From this standard a risk management framework was developed that addresses risk associated with corporate governance, project delivery and rail operations.

Each workgroup within the North West Metro project team has, through structured workshops, identified and reviewed specific risks and opportunities in their area of expertise. Consequently a comprehensive understanding of the project’s total risk and opportunity profile and its impact on project objectives has been achieved.

Full details are provided within this report pertaining to the risk framework, risk management plans, risk workshop outcomes and the resultant risk and opportunity register.
2 Introduction

2.1 Background

On 18 March 2008 NSW Government announced the decision to construct a 38 kilometre North West Metro rail line between Rouse Hill and the Sydney CBD, with construction commencing in 2010. A staged delivery of the line is envisaged with Hills Centre to Epping open by 2015 and the entire line open by 2017.

The North West Metro is planned to run underground from the city, beneath Victoria Road towards Top Ryde, and then via Epping to Castle Hill, Norwest and Rouse Hill. It will have 17 stations including interchanges with key CityRail stations and bus routes.

2.2 Purpose of this Report

This Risk Management Report is a reference document to the Product Definition Report.

The purpose of the Risk Management Report is to provide additional and supporting details relating to risk management, including process, procedures and outcomes associated with identification, analysis, assessment and treatment of risks and opportunities to the North West Metro.

2.3 Definitions and Terminology

The following acronyms and abbreviations as used in this report:

- CBD: Central Business District
- M&E: Electrical and Mechanical
- IVVI: International Validation and Verification Inspection
- NIMO: North-West Integrated Metro Operations
- NSW: New South Wales
- NW Metro: North West Metro
- NWRL: North West Rail Link
- O&M: Operations and Maintenance
- PDR: Product Definition Report
- PRI: Permanent Route Infrastructure
- R&O: Risk and Opportunity
- TBM: Tunnel Boring Machine
- TIDC: Transport Infrastructure Development Corporation
- TP1: Tunnel Package 1, etc
2.4 Supporting documents

This document has been created for the purpose of preparing the North West Metro Product Definition Report and any subsequent submissions to Cabinet. The following documents listed in Part A were created for the purpose of preparing this document, other primary reference documents and the Product Definition Report. The documents listed in Part B were also considered in the preparation of this document.

Part A

- North West Metro Project Risk & Opportunity Register(s)
- North West Metro Draft Product Definition Phase Risk Management Plan
- North West Metro Draft Risk Framework
- North West Metro Draft Risk Policy
- North West Metro Risk Workshop records (June – September 2008)
- Risk Management Process Integration Map
- Risk Output assesment map
- Risk Management Process diagrams
- Report to the Project Team – International Expert Panel
- Report to the Premier - International Expert Panel
- International Validation and Verification Inspection – Findings Report
- North West Metro Scoping Project Risk Management Workshop
- North West Metro Corporate and Project Risk Management Plan
- North West Metro Risk Management Standard
- North West Metro Risk-based Contingency Guidance Document

Part B

- North West Rail Link Risk and Opportunity Register
3 Risk Management Process

3.1 Product Definition Phase Process

The risk management process applied to Product Definition Phase complies with Australian / New Zealand Standard for Risk Management AS 4360:2004. This process is shown pictorially below at Figure 1.

Using AS:4360 as a basic template, risk management was tailored to North West Metro in the following manner:

- Objectives of North West Metro, in particular those relating to the desired transport product and the project delivery goals, were identified and communicated within the project team (refer Section 4 of this report).
- A risk management framework was then developed, recognising key objectives such as whole-of-life outcomes, to provide an enduring platform for risk identification and management throughout all phases of the project (refer Section 5 of this report).
- Using the objectives and draft risk framework as a platform, risks and opportunities were identified and assessed through structured workshops, broadly split by key project scope components and attended by a cross-section of the project team and its advisors (refer Section 6).
- During structured workshops, risk and opportunity treatment plans were also identified, further developed post-workshop by responsible teams and persons (refer Section 7).
- Finally, the process also gave consideration to risk tasks necessary for successful delivery of the project beyond Product Definition Phase (refer Section 8).
4 Objectives

4.1 Transport Product objectives

The transport product objectives set out the overall purpose of North West Metro for North West Metro and are taken from a number of government sources including the Metropolitan Rail Expansion Strategy (MREP), the State Plan, Urban Transport Statement and Metropolitan Strategy.

The transport product objectives are noted below:

- Provide value for money to the taxpayer and transport system users.
- Facilitate investment and growth in diverse housing stock within established and new centres including key worker housing.
- Build a world-class transport system that supports the long term growth and global competitiveness of Sydney.
- Provide congestion relief for existing road and rail systems.
- Improve service, amenity and reliability for existing and future transport networks.
- Provide better and more equitable access to key centres and activities (education, health care, homes, recreation and employment).
- Provide a transport solution that minimises environmental impacts during design, construction and operations.
- Enhance liveability and amenity for existing and future residents and visitors.
- Support a transport system that promotes travel choice.
- Improve health outcomes.
- Build in capacity and flexibility to respond to future change (eg. impacts of peak oil, climate change)
- Maximise potential for further expansion and integration of regional transport network

4.2 Project objectives

In addition to the transport product objectives, the following objectives were set to ensure that project delivery and rail operations goals are in accordance with government’s expectations.

The project objectives are noted below:

- Procurement of a modern, safe, well-maintained, reliable metro rail service for the community.
- Construction commencement by 2010 and staged completion dates of 2015 and 2017 (Note: a revised project completion target of 2016 in a single opening has since been proposed and recommended by the Project Team).
- Minimised whole of life costs and delivering demonstrable value for money.
- Ensuring an effective passenger railway supported by efficient supply of rolling stock, maintenance and operations.
- Delivery in accordance with applicable standards and procedures, including as appropriate the Working with Government Guidelines for Privately Financed Projects.
4.3 Product Definition Phase (risk) objectives

The establishment of phase specific objectives, in particular for risk management, has assisted the identification of risks and opportunities likely impact on the successful delivery of the project and the ultimate transport product.

The Product Definition Phase (risk) objectives are noted below:

- Options analysis and selection (in both design and construction) uses risk-based techniques
- Uncertainty is modelled and decisions justifiable with supporting analysis
- Opportunities are identified and where appropriate, incorporated into the project
- Risks are identified, analysed, evaluated and communicated
- Risk treatment plans developed and implemented
- Contingency Plans for risks are developed and are in place
- Risk management is iterative, and
- Risk management is reported.
5 Risk Framework

5.1 Outline summary

The North West Metro risk management framework was developed to respond to the objectives of all phases of the project including rail operations. The resultant framework is presented below at Figure 2:

A brief summary of each of the nominated documents is provided below:

The Risk Governance and Policy Document is a formal yet concise statement by senior management, designed to communicate the requisite philosophy, approach and desired outcomes for risk management at North West Metro. High level roles and responsibilities are also included within the Risk Governance and Policy document as are nominated risk management principles by which all staff are expected to discharge their roles and responsibilities. A draft copy of this document is included at Appendix A.

The role of the Risk Management Strategy Document is to record and communicate the strategies and mechanisms for originating, collecting, monitoring and reporting of risk related information including timeframes for implementation, audit and training of risk related procedures. The Risk Management Strategy Document brings together the various Risk Management Plans that in totality comprise the “operational” aspects of the project. A framework for the development and implementation of management plans, procedures, processes, tools and techniques is also included.

The Corporate Risk Management Plan is designed to underpin successful Corporate Governance and hence spans all areas of management with key risk areas such as probity, business continuity, compliance and crisis management. A specific risk register forms part of this document.
The purpose of the **Project Phase Specific Risk Management Plan** is to underpin the overall objectives of the project but more specifically to provide a reference point and mechanism to achieve the objectives of the particular phase the project is in. Currently a **Product Definition Phase Risk Management Plan** is in existence and specifically details the processes and procedures, roles and responsibilities required to achieve the desired outcomes for the Product Definition Report. The various Technical Advisor Design Risk Management Plans input into this document. A project specific risk and opportunity register forms part of this document. A draft copy of the Product Definition Phase Risk management Plan is included at *Appendix B*.

The **Metro System Safety Framework** is intended to focus specifically on rail operations however also includes preceding phases such as pre-accrreditiation and accreditation. The processes included within this document will be specifically designed to meet regulators (ITSRR) requirements and concurrently with this, review progress and report on relevant risks to project objectives.

Further details of the risk management framework are attached at *Appendix C*. 
6 Key Risks and Opportunities

Each workgroup within the North West Metro project team has, through structured workshops, identified and reviewed specific risks and opportunities in their area of expertise. Details of the risk workshops held, including agendas and minutes of meeting are attached at Appendix D.

By virtue of the process followed, a comprehensive understanding of the project’s total risk and opportunity profile and its impact on project objectives has been achieved. The resultant Risk and Opportunity Register is attached at Appendix E.

An overview of the key risks and opportunities, complete with corresponding mitigation strategies are set out below.

Table 6.1 Risks, opportunities and management strategies

<table>
<thead>
<tr>
<th>Risk</th>
<th>Management strategy (in place or planned)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Transport Product exceeds budget and/or funding capacity</td>
</tr>
<tr>
<td></td>
<td>- infrastructure specialist cost and commercial advisors engaged to ensure all capital costs are accurately priced and subjected to a probabilistic risk assessment</td>
</tr>
<tr>
<td></td>
<td>- all identified risks and opportunities are managed in a way that first reduces the risk and then makes allowance for residual risk</td>
</tr>
<tr>
<td></td>
<td>- capital cost benchmarking referencing national and international projects either completed or underway</td>
</tr>
<tr>
<td></td>
<td>- value for money considerations to drive risk allocation strategy</td>
</tr>
<tr>
<td></td>
<td>- scope options will be included in the business case</td>
</tr>
<tr>
<td>2</td>
<td>Changes to project scope or objectives beyond Product Definition Phase</td>
</tr>
<tr>
<td></td>
<td>- initial announcement by Government has set strategic intent and alignment</td>
</tr>
<tr>
<td></td>
<td>- Product Definition Report includes analysis of alternative designs and options within designs</td>
</tr>
<tr>
<td></td>
<td>- stakeholder consultation has informed both reference design and alternative options for station locations, interchange and design to meet community concerns/issues etc</td>
</tr>
<tr>
<td></td>
<td>- “Critical Infrastructure” status and North West Rail Link (NWRL) concept approval in place</td>
</tr>
<tr>
<td>3</td>
<td>Timely decisions or approvals are not forthcoming</td>
</tr>
<tr>
<td></td>
<td>- key stakeholders are aware of program milestones and will be managed appropriately to expedite approvals as required</td>
</tr>
<tr>
<td></td>
<td>- working group established between Department of Planning and Project Team</td>
</tr>
<tr>
<td></td>
<td>- project has committed to seek timely decisions</td>
</tr>
<tr>
<td></td>
<td>- Special Purpose Authority formation to be timely</td>
</tr>
<tr>
<td></td>
<td>- working with Treasury to ensure financial data is available</td>
</tr>
<tr>
<td>4</td>
<td>Infrastructure proposal does not deliver customer requirements</td>
</tr>
<tr>
<td></td>
<td>- customer focus achieved through surveys, customer panels and representative group input</td>
</tr>
<tr>
<td></td>
<td>- Shadow Operator responsible for accounting for customer priorities</td>
</tr>
<tr>
<td>5</td>
<td>Transport business not delivered through infrastructure proposal or project delivery strategy</td>
</tr>
<tr>
<td></td>
<td>- whole of life transport product focus central to all decision making</td>
</tr>
<tr>
<td></td>
<td>- Steering Committee business focused</td>
</tr>
<tr>
<td></td>
<td>- Shadow Operator to assist in development of design and delivery strategy</td>
</tr>
<tr>
<td></td>
<td>- International Expert Panel to confirm economic and financial viability</td>
</tr>
<tr>
<td>Risk</td>
<td>Management strategy (in place or planned)</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| 6 Risk transfer as envisaged by contracts is not delivered in reality | ▪ clear communication of proposed risk allocation, based on industry soundings to ensure alignment between market capability and contractual demands  
▪ work packaging to reflect market capability matching risk and reward  
▪ specialist advisors engaged to assist in development of risk allocation matrix  
| 7 Risk that Project Delivery Strategy is not optimal                  | ▪ industry consultation and market sounding period conducted to identify and refine preferred delivery strategy  
▪ international validation and verification inspection has benchmarked proposed strategy with recent successful models  
▪ Shadow Operator involvement in process at early phases to anticipate operator appetite for risk  
▪ International Expert Panel to assess proposed delivery strategy  
▪ specialist advisors to comparatively assess delivery models to ensure value for money is demonstrable  
| 8 Sub-surface geological conditions vary from expectation             | ▪ early geo-technical surveys to identify existing conditions and known areas of difficulty (eg dykes etc)  
▪ geotech results to be included within tender documents with risks shared in an efficient way that achieves value for money for Government  
▪ program includes contingency on TBM production rates  
▪ cost plan contingency assessment includes geotechnical risk  
| 9 Land use opportunities presented by metro transport system are not realised | ▪ stations to be designed in close consultation with Transport and Land Use, Department of Planning (DOP) and local government  
▪ commercial Property experts to be consulted early to appropriately influence design  
▪ implementation of planning reforms to encourage appropriate and timely development around stations  
▪ Special Purpose Authority to have planning powers including compulsory acquisition to ensure development proceeds in timely manner in accordance with desired outcomes for urban and station precinct growth  
| 10 Complexity and extent of land acquisition process is underestimated | ▪ land acquisitions team established with requisite experience and expertise  
▪ compulsory acquisition powers of Special Purpose Authority may be utilised as last resort  
▪ options for land take being assessed; work commenced early  
▪ early procurement has commenced  
▪ Critical Infrastructure status and NWRL concept approval  
| 11 Patronage is substantially different from forecast                | ▪ original market research to better understand likely response to metro  
▪ existing patronage models upgraded to reflect in more detail local demand drivers for Metro catchment  
▪ patronage forecasts risk adjusted to create sustainable upside.  
▪ provision of flexibility in station and train set design to accommodate significant above-forecast patronage growth  
| 12 Operations and maintenance costs                                  | ▪ Shadow Operator is analysing principal areas of cost such as IT, power, resources/staff and maintenance  

<table>
<thead>
<tr>
<th>Risk</th>
<th>Management strategy (in place or planned)</th>
</tr>
</thead>
<tbody>
<tr>
<td>differ from estimates</td>
<td>international benchmarking and peer review test assumptions</td>
</tr>
<tr>
<td></td>
<td>procurement process will seek to identify to tenderers outputs required and a non-exhaustive series of costs</td>
</tr>
<tr>
<td></td>
<td>delivery strategy to allow Operator opportunity to spread cost risks across a range of activities</td>
</tr>
<tr>
<td>13 Reliability and service targets prove difficult to achieve</td>
<td>engagement of specialist resources and design houses with industry experience to lead design study</td>
</tr>
<tr>
<td></td>
<td>international benchmarks to be applied</td>
</tr>
<tr>
<td></td>
<td>systems and sub-systems designed and procured to required reliability</td>
</tr>
<tr>
<td></td>
<td>design must be state-of-the-art but proven internationally</td>
</tr>
<tr>
<td></td>
<td>delivery model likely to be performance-based payments for the operator to maximise chance of delivering targets</td>
</tr>
<tr>
<td>14 Asset integration not complete in time to minimise risk of design rework</td>
<td>works packaged to minimise critical interfaces while value for money is maintained</td>
</tr>
<tr>
<td></td>
<td>design and procurement process structured to ensure design of tunnels, stations and rail systems is properly informed</td>
</tr>
<tr>
<td></td>
<td>interfaces between technical components (e.g. tunnels, stations, rail, signalling, M&amp;E) managed to achieve program milestones</td>
</tr>
<tr>
<td>15 Not all risks are adequately identified</td>
<td>systematic approach to risk identification and management, including a risk management framework that recognises corporate governance, project and rail operations risk</td>
</tr>
<tr>
<td></td>
<td>specialist advisors used to assist with identification, analysis and treatment of key risks</td>
</tr>
<tr>
<td></td>
<td>internal and external peer review implemented</td>
</tr>
</tbody>
</table>
7 Key Risk Treatment Strategies

7.1 Treatment strategies underpinning North West Metro

The following key risk management strategies were identified, developed and implemented by the senior management as a high level means of underpinning the successful achievement of all North West Metro goals and objectives.

7.1.1 Overall Process

The overall process embedded into Product Definition Phase has provided a rigorous and structured approach to achieving a preferred Reference Design that meets all stated objectives and is thus suitable for inclusion within the Product Definition Report.

Robust identification, assessment and evaluation of design and alignment options as well as development of the Project Delivery Strategy, Constructability, Transport and Land Use criteria has been incorporated and interconnected into the overall process.

The Risk Management Process Integration Map attached at Appendix F summarises this process.

7.1.2 Options Review Panel

A structured and iterative process of Options Review was implemented to ensure that design development and resultant design options were assessed, tested and agreed in an environment inclusive of senior management, peers and contemporaries.

7.1.3 Industry Consultation / Sounding

The objectives of the industry consultation and market sounding were:

- To engage with a broad section of the private sector in the areas of rail operators, construction contractors, rolling stock and rail system suppliers and specialists in procurement packaging as soon as possible to enable input into the North West Metro product definition phase;
- To secure the best expertise and advice available internationally from a representative and wide range of suitably experienced and qualified entities from each of the relevant industry sectors in a cost effective and timely manner; and
- To achieve value for money for the NSW taxpayers by ensuring that the NW Metro can:
  - Be procured from a competitive market place;
  - Be delivered cost effectively, within the timeframe required and consistent with capital, operating and maintenance budgets; and
  - Meet all relevant operating, safety, community and environmental parameters.
7.1.4 Shadow Operator appointment

The appointment of Interfleet Technology to the role of Shadow Operator (a first for any major transport infrastructure project in Australia) has facilitated advice on lessons learnt from other metro systems around the world to ensure proven technology and metro operations experience is transferred to Sydney and used on the North West Metro.

7.1.5 NWRL body of knowledge

Given that North West Rail Link has existing government approval and for a portion of the alignment follows that of North West Metro, a certain amount of pre-existing work has been able to be deployed to North West Metro.

7.1.6 International Validation and Verification Inspection (IVVI)

The IVVI involved a two week review of metros within global cities such as London, Dublin, Paris, Copenhagen and Singapore and confirmed the appropriateness of a metro system for Sydney. Furthermore the Reference Design and preferred Project Delivery Strategy were validated as being highly likely to achieve both the stated transport product and project delivery objectives.

The IVVI found that a modern efficient rail transport system can be procured with proven, safe technologies by world experienced organisations in conjunction with leading Australian service providers. Modern metros were found to be characterised by frequent reliable services and shorter travel times in a comfortable environment.

In numerous cities visited, patronage exceeded forecasts due to the high rate of acceptance and performance reliability. Additionally, revenues were typically sufficient to meet the recurrent operating and maintenance costs of the metro.

The IVVI concluded that Government can continue the process with confidence that if it chooses to proceed, a modern driverless metro can be procured and operated in such a way to transform the rail transport experience in a comfortable and pleasant environment. It also should be reasonably assured that its revenues should be sufficient to meet its recurrent costs.

7.1.7 International Expert Panel

In order to ensure further validation and verification of the product definition and delivery strategy a peer review was undertaken by an International Expert Panel during September 2008 within the Product Definition Phase. The week long independent and objective review resulted in the production of two reports, one being submitted direct to the Premier of NSW and the other (a more technical paper) submitted to the Project Team. Overall the process established further confidence that as proposed, the North West Metro transport product meets the needs of Sydney community and is capable of being delivered in accordance with Government’s requirements.

7.1.8 Peer Review

Multiple levels of peer review were employed by the Project Team to verify and validate various aspects of the project, including patronage modelling and the economic appraisal to name but two.
7.1.9 Lessons Learned

There has been a conscious and concerted effort by management to incorporate lessons learned from a variety of sources. International projects, local and national projects were actively sought to be incorporated to the extent they were able to influence positive outcomes for North West Metro. Positive and negative aspects of completed projects are included within the lessons learned. This approach continues to influence design and project delivery strategy considerations.

7.1.10 Specialist Advisors

North West Metro has engaged numerous advisors and industry experts across a wide spectrum of specialisations. This has ensured that as a collective there is adequate in-house knowledge to identify and assess design options whilst drawing on real life experience in order to make sound and logical judgements. Although metro will be new to Sydney and indeed Australia, metro is not new to the Project Team which has effectively brought to bear several hundred years of metro experience.
8 Beyond Product Definition Phase

8.1 Risk-related future tasks

The following is a non-exhaustive list of key tasks identified as being necessary for future phases of North West Metro:

- Risk Framework further development - finalisation, endorsement and sign off risk framework
- Risk Framework implementation – establishment and maintenance of risk management processes and procedures, both from a project sense and a corporate sense and including data collection, reporting, roles and responsibilities etc
- Risk-based tender assessment - procedure and implementation for comparative assessment of designs, tenders and alternative proposals
- Detailed design and construction risk identification, assessment and implementation of treatment strategies
- Detailed project delivery strategy risk identification, assessment and implementation of treatment strategies
- Graphical representation of overall risk profile (ie qty of various risk ratings thus forming an overall picture of quantity of risks and opportunities and corresponding severity
- Monitor / Audit of risk treatment strategy, extent of implementation and effectiveness (ie risk reduction)
- Implementation of lessons learned including subsequent monitor / audit of success or otherwise
- Risk training – awareness, procedural and management training
- Risk software - identify, assess, purchase, train and implement an appropriate proprietry software system for management of risk (eg TIDC utilise Cura)
- Further probabilistic analysis of risks to Capex - detailed analysis through iterative quantification of risks associated with capital cost (Note: draft analysis is included at Appendix G), and
- Probabilistic analysis of risks to Program - full detailed analysis through quantification of risks associated with program/schedule.
APPENDIX A  Draft Risk Governance and Policy Document
APPENDIX B  Product Definition Phase Risk Management Plan
APPENDIX C  Risk Management Framework
## APPENDIX D  Risk Workshop records

The following records are included within this Appendix:

<table>
<thead>
<tr>
<th>Title</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approvals / Community Consultation</td>
<td>28th August 2008</td>
</tr>
<tr>
<td>Land Acquisition</td>
<td>13th August 2008</td>
</tr>
<tr>
<td>Bridges and Civil Works</td>
<td>20th August 2008</td>
</tr>
<tr>
<td>Public Communications</td>
<td>21st August 2008</td>
</tr>
<tr>
<td>Rail Systems</td>
<td>21st August 2008</td>
</tr>
<tr>
<td>Depot and Rolling Stock</td>
<td>22nd August 2008</td>
</tr>
<tr>
<td>Tunnels and Station boxes</td>
<td>22nd August 2008</td>
</tr>
<tr>
<td>Stations</td>
<td>27th August 2008</td>
</tr>
<tr>
<td>Project Delivery Strategy</td>
<td>29th August 2008</td>
</tr>
<tr>
<td>Mechanical and Electrical</td>
<td>3rd September 2008</td>
</tr>
<tr>
<td>Operations and Maintenance</td>
<td>4th September 2008</td>
</tr>
</tbody>
</table>
APPENDIX E  Risk and Opportunity Register
APPENDIX F  Risk Management Process Integration Map
APPENDIX G     Residual Risk Assessment (Capex)