CrossRiver*Rail*

24. Draft Outline Environmental Management Plan

Cross River Rail

CHAPTER 24

DRAFT OUTLINE ENVIRONMENTAL MANAGEMENT PLAN

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24 Draft Outline Environmental Management Plan

24.1 Introduction

This chapter addresses Part B Section 8 of the Terms of Reference (ToR) for the EIS, which requires a draft Outline Environmental Management Plan (EMP) to be detailed for the Project's construction and operation.

The draft Outline EMP sets out the Project approach to design and environmental management for the Project. It establishes environmental design principles and guidelines for the Project and environmental objectives and performance criteria for the construction and operation phases of the Project. It also provides outline mitigation measures to protect the environmental values of the study corridor.

The draft Outline EMP provides guidance and direction for the approach to environmental management for the Project's construction phase, as well as for the Project's operations phase.

The draft Outline EMP is intended to guide the development of more detailed EMPs and relevant sub-plans prepared by the Proponent (or its agent or contracted entity) prior to commencement of the Project's construction and operations phases. In preparing the detailed EMPs and sub-plans, the Proponent (or its agent or contracted entity) must consider any conditions imposed by the Coordinator-General as part of the Coordinator-General's Evaluation Report. Any conditions imposed by the Coordinator-General would prevail over any provision in this draft Outline EMP.

In accordance with the ToR for the EIS, this chapter has been prepared to read as a stand-alone document without reference to other chapters of the EIS.

24.2 Project overview

24.2.1 Cross River Rail

Project design

Cross River Rail would provide a new north-south passenger rail line in Brisbane's inner city, extending from Bowen Hills in the north to Salisbury in the south via the Brisbane central business district (CBD).

The Project comprises two parallel tunnels, approximately 10 kilometres in length extending from Victoria Park at Spring Hill to Yeerongpilly, via the Brisbane CBD, Woolloongabba and Dutton Park. The Project would include new underground stations in the Brisbane CBD at Roma Street and Albert Street, Woollongabba and Boggo Road. New surface stations would also be provided at the RNA Showgrounds and Yeerongpilly. The upgrade of existing stations at Moorooka and Rocklea is also proposed.

North of the tunnel portal at Spring Hill, the Project includes two additional tracks between Spring Hill and the Mayne Rail Yard, with the tracks on an elevated structure within Mayne Rail Yard.

South of the tunnel portal at Yeerongpilly, the Project provides two additional surface tracks between Yeerongpilly and Rocklea and one additional surface track between Rocklea and Salisbury. Facilities would also be provided at Clapham Rail Yard to allow for the stabling of trains during off-peak periods.

Ventilation would be required for the underground sections of new track (ie in the tunnels) and in the underground stations to control the temperature of the stations for passenger comfort, to prevent heat build up in the tunnel and to manage smoke in the event of a fire in the tunnel or station. Air from the stations and tunnel would be vented via outlets at each of the underground stations. An intermediate emergency access and ventilation outlet would also be required at Railway Road, Fairfield.

The tunnel and stations would also be equipped with fire and life safety measures such as cross-passages and emergency egress to the surface.

Flood protection measures would be provided at underground stations, ventilation outlets and the southern tunnel portal. These include automated floodgates at the Albert Street Station and southern portal to protect the tunnel infrastructure against a 1 in 10,000 year flood event.

Project operation

The increased rail capacity within the inner city provided by Cross River Rail would allow the separation of rail operations, including freight, express passenger services and all stop passenger services.

During operation, the Project would cater for express passenger rail services connecting to the existing north-south rail lines linking the Gold Coast, Beenleigh, Sunshine Coast, Caboolture and Petrie to the CBD. Passengers would be able to interchange with existing surface rail services at Yeerongpilly Station, Boggo Road Station (Park Road Station) and Roma Street Station. Passengers would also be able to interchange with the existing busway network at Boggo Road Station (Eastern Busway), Woolloongabba Station (South-East Busway and Eastern Busway) and Roma Street Station (Inner Northern Busway).

The frequency of passenger services on the surface tracks could be increased as a consequence of the capacity enhancement through the inner city. The Project would also allow for enhanced freight capacity on the surface network and stabling of trains during off-peak periods at Clapham Rail Yard.

Project construction

The construction phase would commence with the commencement of works, including early works, site preparation works, demolition works or any other activity necessary for the Project works.

The Project would be constructed using a combination of methods, including:

- cut and cover tunnel construction, where the tunnel is close to the surface
- road headers and limited drill and blast construction for the access shafts, underground stations and some sections of the mainline tunnels
- tunnel boring machines for the Yeerongpilly to Woolloongabba and Woolloongabba to Victoria Park sections of the tunnels
- conventional methods of construction for the two sections of track on viaduct structures (ie Mayne Rail Yard, Moorooka)
- conventional railway construction methods for the sections of surface track between Victoria Park and Mayne Rail Yard, and between Yeerongpilly and Salisbury.

Excavation works would also be required for the construction of dive structures, access shafts, and ventilation facilities.

Construction of Cross River Rail would be conducted simultaneously from a number of construction worksites. The main worksites for construction of the mainline tunnels are located at Yeerongpilly, Woolloongabba and Victoria Park (Spring Hill). Two tunnel boring machines are proposed to be launched at Yeerongpilly and would head north to Woolloongabba where they would be removed.

Two tunnel boring machines would be launched at Woolloongabba and would head north to Victoria Park at Spring Hill, where they would be removed.

Worksites would also be required at each of the stations the ventilation and emergency access building and for the surface road and track works. The northern surface works would be constructed from worksites at Mayne Rail Yard and O'Connell Terrace and the southern surface works from worksites at Clapham Rail Yard, Rocklea and Salisbury.

The construction phase is expected to be approximately 5.5 years and is proposed to commence in 2015.

24.2.2 Environmental impact statement process

On 26 March 2010, the Coordinator-General declared Cross River Rail to be a "significant project for which an EIS is required" under Section 26(1)(a) of the State Development and Public Works Organisation Act 1971 (SDPWO Act).

The draft ToR for the EIS was publicly notified from 10 April 2010 to 17 May 2010. The Coordinator-General finalised the ToR on 19 August 2010 following consideration of comments received on the draft ToR from the community and government agencies.

The EIS addresses those matters identified in the ToR. The overall objective of the EIS is to ensure that potential environmental, social and economic impacts of the Project are identified and assessed and that adverse impacts are avoided or mitigated and managed.

The assessment of potential impacts considers the beneficial and adverse impacts of the Project's construction and operation, as well as direct, indirect and cumulative impacts. Measures to avoid, or mitigate and manage potential impacts and maximise benefits of the Project are also recommended and are presented in this draft Outline EMP.

The EIS also outlines the legislation and other non-statutory guidelines administered by the Commonwealth and State Governments and Brisbane City Council relevant to the environmental aspects of the planning, construction and operation of Cross River Rail.

24.3 Management structure

A rigorous approach to environmental management is required to deliver the Project with the least possible impact on communities and local businesses, and the least delay to the construction phase.

A clear implementation and management structure is required to achieve sound environmental management. The draft Outline EMP provides a suggested structure, which regardless of the contractual delivery mechanism adopted for the Project, incorporates the following parties and their respective roles and responsibilities:

- Queensland Government (Proponent)
  - administrator of the head agreement or contract(s)
  - liaises with relevant agencies within the Queensland Government, Queensland Rail, and Brisbane City Council, for the smooth and efficient delivery of the Project
  - ensures that detailed designs are prepared in accordance with this draft Outline EMP and that detailed EMPs are prepared for the construction and operation phases of the Project
  - ensures that prior to commencement of any work, all necessary approvals are obtained, including development approvals, environmental licenses, workplace health and safety and all other construction-related approvals

  - ensures that all designs are prepared and construction works conducted in accordance with the contract(s), design guidelines, EMPs and sub-plans and relevant legislation and regulations
  - maintains open and effective communications with communities affected by the Project works for the duration of the construction phase, about the construction program, scale, duration and nature of proposed work, and details of proposed impact mitigation measures and monitoring of impacts
  - ensures the safe and efficient operation of the Project, upon completion of the construction phase, in accordance with contract conditions, relevant legislation and regulations
- Queensland Government (regulator and stakeholder)
  - represented by the Coordinator-General who evaluates the EIS and is the concurrence agency for IDAS approvals of the Project under the *Sustainable Planning Act 2009*
  - the regulator for Project construction and operational activities, represented by those agencies administering the relevant legislation, regulations and codes (refer to attached schedule)
  - an owner of land in the study corridor, represented by the Department of Environment and Resource Management (DERM) or lessees nominated by the DERM, as well as the Department of Public Works and the Department of Education and Training.
- Brisbane City Council
  - as a major stakeholder, with interests in land, local roads and other urban infrastructure, with whom the Queensland Government would liaise prior to finalising urban design measures, local management plans (eg construction traffic, pedestrian management, utilities)
  - the regulator for works undertaken by entities other than the Queensland Government, Council also regulates the performance of works according to local laws, including City Plan, and delegated State laws under Brisbane City Council jurisdiction. Works for the Project, being undertaken by the State, are exempt for such regulations and local laws.
- Community Liaison Groups
  - provide comments in an advisory role to the Proponent on the design guidelines and the detailed EMPs for construction and operations of the Project
  - provide advice to the Proponent during the construction phase in relation to identifying and mitigating the impacts of construction in the locality for each group
  - provide information to the wider community in relation to construction programming, the nature of construction work and the impact mitigation measures.

The structure of the management method for the construction phase must include a certified environmental management system (EMS) including the Construction EMP and a certified Quality Assurance (QA) system to comply with ISO14001. The EMS must describe the necessary procedures to be followed to meet the relevant design guidelines and environmental management requirements for the construction phase of the Project.

The Construction EMP would be an integral part of the EMS and would guide construction activities in accordance with the draft Outline EMP and the Coordinator-General's conditions. This would be included in the EMS as a "special process" to ensure the effective implementation of the Construction EMP as part of the Proponent's (or its agent's or contracted entity's) formal management systems. Implementation of the Construction EMP and the QA system must be subject to inspection, testing, reporting and auditing to monitor and demonstrate conformance during the construction phase of the Project.

24.3.1 Overall responsibilities

The likely responsibilities and accountabilities of various parties who would have active roles in the environmental management of the Project is provided in the following tables. The responsibilities have been divided into the construction (**Table 24-1**) and operations (**Table 24-2**) phases of Project delivery.

Table 24-1 Project responsibilities – construction

Entity	Project responsibilities – construction
Queensland Government (regulatory and stakeholder)	• Provide readily available expertise for construction as required. • Carry out responsibilities as regulators in specified fields and legislative roles including administration of relevant statutes, regulations and codes in relation to the Project. • Review of the Construction EMP and Operations EMP prepared by the Proponent (or its agent or contracted entity) for compliance with the draft Outline EMP and the Coordinator General's Evaluation Report and conditions • Undertake periodic reviews and audits of the Proponent's performance where required by the contract or the Coordinator-General's Evaluation Report and conditions
Brisbane City Council	• Carry out responsibilities as regulators in specified fields and legislative roles including delegated administration of permitting assessment and management of local law requirements. • Liaise with the Proponent on relevant matters, such as urban design measures or local management plans
Proponent (or contracted entity)	• Manage the construction process. • Develop the Construction EMP in accordance with the Conditions of Contract (Environmental Management) for the Project, the draft Outline EMP, and the Coordinator-General's Evaluation Report for submission to the Queensland Government. • Maintain a master copy of the Construction EMP containing a record of the completion of planned actions, monitoring records, and reports which are made available during the audits. • Maintain a copy of the legislation, guidelines and standards listed in the draft Outline EMP at each worksite. • Obtain all necessary statutory approvals and licences and ensure that conditions of licences/approvals/permits are met and updated into the Construction EMP. • Provide copies of the Construction EMP to the relevant Project staff having responsibilities defined in the Construction EMP. • Provide environmental and sustainability training to Project staff and maintain a record of all training undertaken by all Project staff, detailing the type and purpose of the training. • Ensure that environmental protection measures are implemented in accordance with the Construction EMP. • Undertake regular monitoring in relation to environmental management issues and ensure that monitoring results are made available to the Project's management team and the community liaison groups. • Ensure corrective actions arising from self-assessments and external audits are completed immediately and in accordance with the Construction EMP. • Notify any relevant State agency and the Brisbane City Council of any environmental incidents and maintain a record of events relating to the environmental incidents including any remedial action taken. • Ensure there is adequate and accurate identification and reporting of any non-conformances and any other environmental issues that may arise during construction. • Provide relevant and timely information to communities, local businesses and other

Entity	Project responsibilities – construction
	relevant stakeholders about construction activities, potential impacts and mitigation measures and, as required, consult with residents, businesses, organisations or other individuals that may be impacted directly by construction activities to ensure direct Project impacts are being appropriately managed. • Establish and maintain a process for receiving, recording and responding to complaints about construction issues. • Establish community liaison groups and appoint an independent community consultation specialist(s) to facilitate and convene the community liaison groups and to ensure efficient but comprehensive communication between the community liaison group and other parties occurs.
Community Liaison Groups	• Provide timely advice to the Proponent about construction impacts. • Participate in independently facilitated meetings at appropriate intervals to consider and provide feedback to the Proponent about design options, construction activities and views received from the greater communities. • Provide timely reviews of complaints reporting, monitoring results and any other relevant data made available by the Proponent. • Provide approved construction information to the wider community, as required.

Table 24-2 Project Responsibilities – Operation

Entity	Project responsibilities – operation
Queensland Government (regulatory and stakeholder)	• On-going administration of relevant statutes, regulations and codes in relation to the Project. • In an arrangement with the Proponent and Operator, provide emergency services to the Project including ambulance, fire fighting, chemical hazards emergency services and policing services. • Liaise as required with the Proponent, the Operator, and Brisbane City Council to ensure that the public transport networks that require access to the Project are coordinated and operate efficiently. • Review of the OEMP prepared by the Operator. • Undertake periodic reviews and audits of the Proponent's performance where required by the contract or the Coordinator-General's Evaluation Report and conditions. • Oversee the operation of the Project within the context of the metropolitan and regional rail networks to ensure that the Project is efficiently integrated and is able to achieve its goals.
Proponent	• Develop the Operations EMP in accordance with the Conditions of Contract (Environmental Management), the draft Outline EMP and the Coordinator-General's Evaluation Report and conditions. • Monitor the environmental performance of the Project and provide regular reports to relevant Queensland Government agencies. • Ensure that the Project is operated safely and with evidence of good environmental management practice at all times.
Brisbane City Council	• To the extent required, work with the Queensland Government (Translink) in managing and integrating the daily coordination of the public transport networks throughout Brisbane.
Community Liaison Groups	• For the first 12 months of operation only: • review in a timely manner, the environmental reports prepared by the Proponent • community feedback would be sought through the Queensland Rail Community Reference Group program.

24.3.2 Environmental responsibilities

There are a number of general Project responsibilities for all entities involved in the Project, with respect to the *Environmental Protection Act 1994*.

Each member of the Project staff has a general environmental duty under Section 319 of the Act, and must not carry out any activities that cause, or are likely to cause, environmental harm, unless all reasonable and practical measures are taken to prevent or minimise harm. If in the performance of their work, Project staff notice that serious or material environmental harm is being caused or threatened by their actions or the actions of someone else, they must report the matter of the Act.

Additionally, Project staff will be required to comply with the following items at all times:

- the Proponent's, or its agent or contracted entity's, environmental policy and EMS
- relevant legislation, with particular attention to environmental legislation under this draft Outline EMP
- EMP requirements including relevant criteria for design, construction and operation
- training requirements.

24.3.3 Training and awareness

Specific training and awareness requirements are outlined in **Table 24-3**. Environmental training for on-site staff must be provided during the site induction. Any further environmental training should be provided on an on-going or periodic basis as required.

Table 24-3 Project responsibilities – training and awareness requirements

Entity	Project responsibilities – training and awareness requirements

Proponent, or its agent or contracted entity	• General environmental duties under the following legislation:
	  • *Environmental Protection Act 1994*
	  • *Aboriginal Cultural Heritage Act 2003*
	  • *Coastal Protection and Management Act 1995*
	  • *Fisheries Act 1994*
	  • *Sustainable Planning Act 2009*
	  • *Vegetation Management Act 1999*
	  • *Water Act 2000*
	  • *Queensland Heritage Act 1992.*
	• Specific environmental objectives and mitigation measures including:
	  • general responsibilities in relation to the design of the Project
	  • responsibilities under the design guidelines and the Construction EMP in relation to implementing mitigation measures, monitoring, reporting and implementing corrective actions
	  • responsibilities in the event of an environmental incident
	  • the consequences of not implementing mitigation measures or departure from specified operating conditions
	  • internal and external communication processes
	  • community perspectives and expectations
	• Project systems, including quality, safety and document control.

24.3.4 Communications

Internal communications

Environmental management should be achieved through clear and concise internal communications extending through the Proponent's organisation to the workforce 'on the ground'. These lines of communication should be subject to periodic review to ensure that the communication structure is performing adequately and that all actions are performed and recorded. The reviews should also provide for follow-up on specific or corrective actions raised during previous audits to ensure responses are complete.

The internal communication process and structure for formal reporting should be clearly illustrated in the Construction EMP.

External communications

To ensure clear communication, only Project staff nominated and approved by the Proponent should be involved in consultation with external bodies on environmental issues.

External communication responsibilities, training and processes should be detailed in the Construction EMP.

24.4 Monitoring, auditing and reporting strategies

24.4.1 Reporting

Project documents, including the Construction EMP, are intended to be 'living documents' subject to updates and revisions during delivery of the Project. Document control is the responsibility of the Proponent. Project documents must be available for inspection on request by an agency with regulatory responsibilities for aspects of Project delivery.

Revisions of the Construction EMP must be made available to the relevant regulatory agencies and the Coordinator-General prior to the commencement of works to which the revisions relate.

24.4.2 Monitoring responsibilities and standards

The Proponent is responsible for monitoring each element in the various Project phases to ensure the necessary and agreed mitigation measures are implemented. The specific monitoring actions for each environmental element must be finalised in the Construction EMP and the Operations EMP, and must address monitoring requirements identified in this draft Outline EMP.

The Proponent must undertake the monitoring of the environmental elements in the Construction EMP, and report on conformance at least on a monthly basis. The monitoring must address environmental performance, non-conformances, audit results, necessary changes in construction details, new standards or legislation and any other requirements.

Monitoring equipment must be calibrated regularly and the results of the calibrations recorded. All monitoring and sampling undertaken must be in accordance with the relevant agency guidelines or Australian Standards. All analytical testing performed must use National Association of Testing Authorities (NATA) approved procedures or if this is unavailable, be performed to the best relevant standard. New technologies or materials may be used provided standards and outcomes are equal to or exceed current recognised standards.

A mechanism for reporting on compliance must be established in the Construction EMP, consistent with the hierarchy of reporting in **Table 24-4**, or as otherwise defined in the Project approvals.

Table 24-4 Reporting hierarchy

Report	Frequency and scope	Method of reporting
Construction compliance report	Monthly: • undertaken by an independent, and appropriately qualified person • compliance with Coordinator-General's conditions and details of any non-compliances • satisfaction of environmental objectives and performance criteria and mitigation measures established by the Construction EMP • response to incidents and non-compliances, including recommendations for corrective actions, responsibility and timing • reporting of recorded complaints, responses and corrective actions • all other matters pertaining to environmental performance during construction.	• Three hardcopies and one electronic copy to the Coordinator-General and the Department administering the *Environmental Protection Act 1994*. • One hard copy to be tabled at the following meeting of the community liaison groups. • Posted on the Project website for the duration of construction works.
Construction incidents and non-compliance report	Interim report: • within two days of an incident, or a non-compliance with a condition, or requirement being identified • details of the incident or non-compliance and initial response. Comprehensive Report: A comprehensive report must be provided as part of the next monthly report, or within 14 days after the interim report, whichever comes sooner, and must include: • details of the incident or non-compliance including its cause • response to the incident or non-compliance • corrective actions taken and responsibility • timing of the corrective actions • any revisions of the Construction EMP to reduce the potential for the incident re-occurring.	• Three hardcopies and one electronic copy to the Coordinator-General and the Department administering the *Environmental Protection Act 1994*. • Posted on the Project website for the duration of construction works.
Operation – Safety Performance Report	• Annually as required by the Transport (Rail Safety) Act 2010 and the Transport (Rail Safety) Regulation 2010.	• Must be given on the approved form for a return of annual information.

24.4.3 Non-compliance and corrective actions

The reporting and monitoring must incorporate continual improvement requirements identified through a non-compliance and corrective action procedure. These must be nominated in the Construction EMP, as part of the EMS, and must specify methods for recording and reporting non-conformances and ensuring that corrective actions are implemented to rectify the problem.

The non-conformances and corrective actions may trigger a review and modification of practice. When necessary, such modifications must be reflected in amendments to the EMS, including the Construction EMP. The non-compliance process should include a complaints mechanism or procedure for the further identification of non-conformances and issues outside the scheduled monitoring and reporting phases.

24.5 Community engagement and communication plan

A community and stakeholder engagement plan is to be developed by the Proponent to keep the community and stakeholders informed about construction of the Project. This is to be developed during the construction phase but prior to the commencement of construction works and is to be managed, updated and implemented for the duration of the construction phase.

During the operations phase of the Project, community engagement and communication is to be undertaken as part of the existing Queensland Rail and TransLink processes.

24.5.1 Community engagement process

Consultation must be conducted throughout the construction phase with local communities potentially affected by the construction works, as well as the wider community such as public transport users and road users, including pedestrians and cyclists.

The community engagement process must include:

- early establishment of community information services including, but not limited to, toll-free telephone service with 24 hour, seven day servicing, Project website and email service, regular newsletters, scheduled information sessions or open days
- availability of information through the Project website generally and in response to specific inquiries about environmental performance
- early and on-going engagement with owners and occupants of premises adjacent or close to the proposed works or proposed mitigation measures
- early notification to owners and management of “sensitive receptors” that are likely to be affected by proposed construction works in terms of their scale, duration, location and potential effects
- establishment of community liaison groups, as described in **Section 24.5.2**
- where required, special procedures to respond to complaints, issues or incidents, such as face-to-face meetings and on-going communications with affected parties and a documented process for issues resolution.

Consultation is to commence well in advance of the commencement of construction works and, in some circumstances, would commence with the design of mitigation measures during detailed design. It must also be conducted in detail sufficient to address specific construction impacts and mitigation requirements.

Consultation with directly-affected property owners and occupants must be conducted in confidence where requested by the owners or occupiers of premises.

24.5.2 Community liaison groups

Community liaison groups must be convened by the Proponent or its agent or contracted entity, within the construction phase of the Project but prior to commencement of construction works. Such groups would meet regularly until completion of the construction and would have the purpose of providing timely, open advice and representations of community issues and concerns arising from the Project.

The community liaison groups would undertake the following tasks:

- review and provide feedback to the Proponent about construction plans and programs for the purpose of informing the relevant communities about the construction Phase of the Project
- provide community feedback to the Proponent about concerns with the Project's construction
- provide feedback to the Proponent in relation to construction issues as required.

The Proponent must keep the Coordinator-General informed of the views and issues raised in meetings of the community liaison groups by providing endorsed copies of minutes and other meeting records as required.

During the operations phase of the Project, community feedback would be sought through the Queensland Rail Community Reference Group program. For the first twelve (12) months of operations, feedback also would be sought from the community liaison groups established during the construction phase.

24.5.3 Complaints and responses

The environmental management process managed by the Proponent must include a procedure for receiving and responding to complaints. Attention to complaints must be carefully managed, promptly and effectively, and form a key part of the environmental reporting mechanism. Responsibility for maintaining the complaints procedure would rest with the Proponent or its agent or contracted entity.

Basic requirements for the complaints process, to be included in the draft Outline EMP (Construction), include:

- a procedure for receiving and responding to complaints
- a mechanism for notifying the community of the complaints procedure and how it may be accessed
- the Proponent maintaining a toll-free telephone service operated on a 24 hour, seven days a week basis, during the construction phase
- The process for registering and handling complaints received, including a data base for tracking of complaints and actions taken in response. The data base must include
  - the time and date each complaint is received
  - details of the complainant and the recorder of the complaint
  - the specific activity causing the complaint including the place, time and date of the action or activity
  - the entity responsible for addressing the complaint
  - the action taken to address the complaint, if necessary
  - feedback given to the complainant
  - time and date on which the complaint was addressed and closed out
  - immediate communication of the complaint to the nominated representative of the Proponent
  - details on how the action taken by the Proponent was communicated to the complainant and the Coordinator-General
  - any subsequent remedial action required to avoid cause for future complaints if relevant

- regular reporting to the community and the DERM of complaints and corrective actions
- monitoring and auditing of the complaint handling system.

During the operations phase of the Project, the complaints system would be incorporated into the existing Queensland Rail and TransLink Customer Feedback procedures.

24.6 Draft Outline EMP

24.6.1 Overview

This draft Outline EMP is presented on the understanding that a detailed Construction EMP and Operations EMP, as well as relevant sub-plans, will be prepared by the Proponent, or its agent or contracted entity, and approved by a relevant State agency. Such detailed plans must be prepared and approved prior to the commencement of the Project phase to which they relate.

The draft Outline EMP reflects the Proponent's commitments to the approach to environmental management for the Project.

The detailed EMPs would be dynamic documents and would be updated to incorporate further information and public concerns, approval conditions, changes in environmental management procedures in the light of on-going monitoring results, new techniques and relevant legislative requirements.

Each EMP would be supported by a range of sub-plans. The Construction EMP sub-plans are likely to deal with matters such as:

- soil erosion and sedimentation
- construction air quality, including dust
- noise and vibration
- flooding
- surface water quality and groundwater quality
- spoil removal, haulage and placement
- hours of work and work practices at each worksite
- safety hazard and risk
- community liaison and communications.

The operations sub-plans are likely to deal with matters such as wastewater management and disposal, landscape management and maintenance, emergency and risk procedures, flooding and groundwater management, community liaison and communications.

24.6.2 Planning for Ecologically Sustainable Development

The Project would pursue the achievement of the following overall objectives for Ecologically Sustainable Development during the design, construction and operations phases:

- adopt and integrate management practices to avoid or minimise and mitigate the impacts of the Project through the design, construction and operation phases, across all aspects of the Project, including
  - identify and implement where practicable, energy efficiency measures (eg power demand management during construction, alternative energy supplies, natural lighting and ventilation in appropriate locations)
  - waste minimisation, management, recycling and undertaking lifecycle assessments

  - wise use and re-use of natural resources (eg air, water including groundwater, rock and other spoil)
  - water efficiency measures (eg water harvesting at stations for use in landscape irrigation)
  - maintenance of ecological processes and protection and enhancement of habitat values (eg at Breakfast Creek, Victoria Park and Moolabin Creek)
  - avoid if possible or minimise and mitigate potential impacts on cultural values, communities and community facilities, businesses and other employment
  - optimise potential inter-generational benefits (eg enhanced accessibility, provision for alternative modes of transport including public transport walking and cycling)
- comply with all applicable laws, regulations, standards and guidelines for the protection of the environment
- establish monitoring and reporting procedures to identify impacts on the environment
- establish incident response protocols and procedures, including
  - lines of command or responsibility and extent of jurisdiction for categories of incidents
  - an integrated emergency response arrangement and procedures between the emergency services, Queensland Police, hospitals, the Project operator, and DERM
  - an integrated environmental incident management group
- provide Project employees and the Proponent with adequate training in safety, hazard and risk management, environmental procedures and social obligations
- support the role and function of the Community Liaison Groups
- identify opportunities for community involvement in the design of public open spaces (eg at station entrances, plazas, etc).

24.6.3 Implementation

This draft Outline EMP provides a framework within which the detailed EMPs and sub-plans would be developed. It incorporates:

- regulatory requirements
- the findings of the EIS
- community engagement
- effective environmental management
- general content requirements of ISO 14001
- management and responsibility for performance.

An outline of how each EMP is to be developed is shown in **Table 24-5**.

Table 24-5 EMP Elements

EMP component	Description	Effect
Environmental element	Aspect of construction or operation to be managed (as it affects environmental values).	Mandatory (must be addressed)
Environmental objective(s)	The management objective of the Project for the specific environmental element.	Mandatory (must be achieved in all circumstances)
Performance criteria	The performance criteria are designed to contribute to the overall objective(s) for the specific environmental element. The performance criteria are to be measurable to ensure that achievement of the environmental objective can be monitored.	Mandatory (must be achieved)
Mitigation measures	Mitigation measures may include strategies, tasks and actions to achieve the performance criteria. Such measures must be directed to achieving the environmental objectives and performance criteria, as well as statutory requirements or conditions imposed by the Coordinator-General. The mitigation measures may include those in the draft Outline EMPs or other measures that achieve the environmental objectives, performance criteria, statutory requirements or conditions imposed by the Coordinator-General. Mitigation measures may include such things as changes in work procedures or practices or physical interventions.	Advisory measures (designed to achieve the goals and the environmental objectives)
Monitoring	The monitoring requirements to measure the actual performance against the environmental objectives and satisfaction of the performance criteria.	Mandatory (monitoring design must relate to performance criteria)
Reporting	Purpose and frequency of reporting to demonstrate achievement of the environmental objectives and satisfaction of the performance criteria.	Mandatory

24.6.4 Glossary of terms

While the draft Outline EMP is provided as a guide document for the preparation of the Construction EMP and Operations EMP, it contains a number of terms to which particular meanings are attributed. The terms and their meanings are provided in **Table 24-6**.

Table 24-6 Terms and Meanings

Term	Meaning
Best practice	Australasian techniques, methods or processes widely accepted at the time to achieve the environmental objectives.
Construction	Any action undertaken to implement the Project and includes demolition works, site preparation works, clearing and removal of vegetation and works for the rehabilitation of worksites.
Construction spoil	Includes any earth or material removed from a construction site, including sites for surface works or underground works.
Contractor	A person or entity engaged by the Proponent (an agent or contracted entity) to undertake works or actions leading to the implementation of the Project.
Excessive dust and air emissions	Occurs when dust deposition and other air-borne contaminants measured at a sensitive place exceed the goals stated in Table 24-17: Air quality – construction.
Excessive noise	Occurs when noise measured at a sensitive place exceeds the goals for internal noise stated Table 24-18: Noise and vibration – construction of this draft Outline EMP, or the background noise whichever is greater.
Excessive vibration	Excessive vibration occurs when vibration measures at a sensitive place exceeds the goals stated in Table 24-18: Noise and vibration – construction, of this draft Outline EMP.
Haulage	The transportation of construction components, materials, plant and equipment and spoil required for, or resulting from, construction of the Project.
Least impact, least delay	The outcome reached by agreement between the Proponent or the contractor and owners and occupants of properties that would be directly-affected by the Project, in which the environmental objectives are met with the least delay in construction programme.
Local street	Any road or street that is not a State-controlled road and is not part of the regional road network or is not a major road indicated in City Plan 2000, Strategic Plan, Map D – Movement System.
Locality	The area influenced or predicted to be influenced directly by the effects of the Project in either its construction or operation. The term is intended to be applied for the purpose of impact assessment, management and mitigation. The term does not include areas affected indirectly.
Social environment	Includes residential and neighbourhood amenity, connectivity, community health, community diversity, social infrastructure provision and safety.
Worksite	Surface land used for construction activities.

24.7 Environmental requirements and obligations

Delivery and implementation of the Project must achieve the environmental objectives established in this draft Outline EMP and any additional requirements as per the Coordinator General's Evaluation Report and conditions. Furthermore, delivery and implementation of the Project must meet the environmental expectations of the broader community and the local communities to the extent reasonable and practicable, having regard for and balancing the wider, long-term benefits of the Project against the localised, short-term impacts of construction and rail operations.

These community expectations are:

- for the broader community, reflected in relevant standards and controls
- for local communities, those identified during the community consultation process undertaken for the Project, including the EIS, during the detailed design phase.

The requirements presented in this draft Outline EMP apply to all aspects of the construction and operation phases of the Project and need to be incorporated into the draft Outline EMP (Construction) and draft Outline EMP (Operations) and sub-plans. All personnel engaged on the Project will be bound to comply with the requirements of the draft Outline EMP (Construction) and draft Outline EMP (Operations) and their sub-plans.

Applicable legislation, policies, a range of guidelines and associated standards relevant to construction works and environmental protection are listed in **Section 24.7.1** to **Section 24.7.3**. The Proponent's, or its agent or contracted entity's Environmental Management representative would hold copies of the listed legislation, guidelines and standards at each worksite.

24.7.1 National strategies and international conventions

The following national strategies provide high-level guidance for the design, construction and operation of the Project, and have been used in the preparation of the EIS and this draft Outline EMP:

- National Strategy for Ecologically Sustainable Development 1992
- National Strategy for the Conservation of Australia's Biological Diversity 1996
- National Greenhouse Strategy 1998
- National Environmental Protection (Ambient Air Quality) Measure 1998.

Relevant international conventions are:

- The Agreement between the Government of Australia and the Government of the Peoples Republic of China for the Protection of Migratory Birds and their Environment 1986 (CAMBA)
- The Agreement between the Government of Japan and the Government of Australia for the Protection of Migratory Birds and Birds in Danger of Extinction and their Environment 1974 (JAMBA)
- The Ramsar Convention on Wetlands of International Importance 1971
- The Bonn Convention on the Conservation of Migratory Species of Wild Animals 1979
- The United Nations Convention on Biological Diversity 1992.

24.7.2 Commonwealth legislation

Commonwealth legislation that is relevant to the Project and the draft Outline EMP includes:

- Environment Protection and Biodiversity Conservation Act 1999
- Native Title Act 1993
- National Greenhouse and Energy Reporting Act 2007.

24.7.3 Queensland legislation

Environmental Protection Act 1994

The *Environmental Protection Act 1994* (EP Act) is the overarching legislation for the regulatory management of the environment in Queensland. The EP Act is based on self-regulation and a duty of care, which places the responsibility for protection of the environment on all persons during the conduct of all activities.

The EP Act provides for the granting of development approvals and registration certificates for the Environmentally Relevant Activities (ERA). The EP Act also provides the power to administering authorities to order actions to be taken to improve environmental performance, conduct audits and environmental evaluations of activities, approve environmental management programs and impose penalties or prosecute persons for non-compliance within the requirements of the Act.

The EP Act is the primary legislative environmental tool in Queensland. The EP Act also allows for the preparation of Environmental Protection Policies (EPPs). The following EPPs have been made:

- Environmental Protection (Water) Policy 2009
- Environmental Protection (Noise) Policy 2008
- Environmental Protection (Air) Policy 2008
- Environmental Protection (Waste Management) Policy 2000.

Other legislation

The Cross River Rail EIS has been prepared under the *State Development and Public Works Organisation Act 1971* (SDPWO Act). Relevant information in the EIS is relied upon to support applications for permits, licences and approvals. Major legislation relevant to the Project includes:

- Aboriginal Cultural Heritage Act 2003
- Acquisition of Land Act 1967
- Building Act 1976
- City of Brisbane Act 2010
- Coastal Protection and Management Act 1995
- Dangerous Goods Safety Management Act 2001
- Electricity Act 1994
- Electrical Safety Act 2002
- Environmental Protection Act 1994
- Explosives Act 1999
- Fisheries Act 1994
- Food Act 2006
- Land Act 1994
- Land Protection (Pest and Stock Route Management) Act 2002
- Local Government Act 2009
- Plant Protection Act 2002
- Plumbing and Drainage Act 2002
- Queensland Heritage Act 1992
- Survey and Mapping Infrastructure Act 2003
- Sustainable Planning Act 2009
- Transport Operations (Road Use Management) Act 1995
- Transport Operations (Marine Safety) Act 1994
- Transport Planning and Coordination Act 1994
- Transport Security (Counter Terrorism) Act 2008
- Transport (Rail Safety) Act 2010
- Transport Infrastructure Act 1994
- Urban Land Development Authority Act 2007
- Vegetation Management Act 1999
- Water Act 2000
- Workplace Health and Safety Act 1995

24.7.4 Guidelines, codes and standards

There are a number of guidelines and codes to be considered in developing the CEMP and OEMP for the Project. These include:

- Queensland Rail standards including
  - Code of Practice – Noise Management
  - Environmental Management System
  - Environmental Sustainability Policy
  - Station Design Guide.
- Brisbane City Council environmental policies including
  - EM001 Environmental Policy
  - EM002 Bushland Protection Policy
  - EM005 Environmental Impact Assessment Policy
  - EP001 Fire Ant Management Procedure
  - CS5 Carbon Neutral Policy.
- Brisbane City Council Guidelines including
  - Best practice guidelines for the control of stormwater pollution from building sites
  - Urban Stormwater Management Strategy
  - Erosion Treatments for Urban Creeks
  - Natural Channel Design
  - Sediment Basin Design, Construction and Maintenance
  - Stormwater Outlets in Parks and Waterways
  - Landscape Design for Water Conservation
  - Guidelines for Pollutant Export Modelling
  - Table Drains Erosion Control Guideline
  - Guidelines on Identifying and Applying Water Quality Objectives in Brisbane City.

The standards described in **Table 24-7** apply to monitoring and auditing of performance.

Table 24-7 Performance guidelines

Element	Performance guidelines
Hazard and Risk	AS/NZS ISO 31000: 2009 Risk Management – Principles and Guidelines AS 1216 Classification, Hazard identification and Information Systems for Dangerous Goods AS 1678 Emergency Procedure Guides – Transport AS 1940 Storage and Handling of Flammable and Combustible Liquids AS 3780 The Storage and Handling of Corrosive Substances AS 2809 Road Tank Vehicles for Dangerous Goods AS 2931 Selection of Use of Emergency Procedure Guides for Transport of Dangerous Goods AS 2187 Explosives – Storage, Transport and Use
Waste and Wastewater	Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2000 (ANZECC 2000) Queensland Water Quality Guidelines 2006, and associated updates, EPA Water Quality Sampling Manual – For use in testing for compliance with the Environmental Protection Act 1994. Third edition (EPA 1999) Standard Methods of the Examination of Water and Wastewater – American Public Health Association (APHA)/Australian Waste Water Association (AWWA) AS 2031 Selection of Containers and Preservation of Water Samples for Chemical and Microbiological Analysis Guidelines to the Recycling Policy for Buildings and Civil Infrastructure (Queensland Government 2009)
Surface Water	EPA Best Practice Urban Stormwater Management - Erosion and Sediment Control Guidelines 2007 Queensland Urban Drainage Manual 2007 Draft Urban Stormwater - Queensland Best Practice Environmental Management Guidelines 2009
Soils	Australian and New Zealand Environment and Conservation Council (ANZECC)/National Health and Medical Research Council (NHMRC) – Guidelines for the Assessment and Management of Contaminated Sites Queensland Government Chemical Laboratory – Guidelines for Soil Sampling Queensland Acid Sulphate Soils Investigation Team (QASSIT) - Sampling and Analysis Procedure for Lowland Acid Sulphate Soils (ASS) in Queensland, dated 1 October 1997. Draft Guidelines for the Assessment and Management of Contaminated Land in Queensland (Department of Environment 1998) Soil Erosion and Sediment Control, Engineers Guidelines for Queensland
Air	AS 2923 Guide for measurement of horizontal wind for air quality applications
Noise and Vibration	Environmental Guideline Noise from Construction, Maintenance & Demolition Sites (EPA 1989) Noise Measurement Manual (EPA 1995) AS 1055.1 and AS 1055.2 Acoustics – Description and Management of Environmental Noise AS 2436 Guide to Noise Control on Construction, Maintenance and Demolition Sites

Element	Performance guidelines
	AS 2107 Acoustics – Recommended noise levels and reverberation times for building interiors AS 1055.1 Acoustics – Description and measurement of environmental noise. British Standard 7385 Evaluation & Measurement for reverberation in buildings German Standard DIN4150 AS 2659.1 Guide to the Use of Sound Measuring Equipment AS 2659 Sound Level Meters AS 2702 Acoustics – Methods for Measurement of Road Traffic Noise. Calculation of Road Traffic Noise (CORTN88) United Kingdom Department of Transport.
Lighting	AS4282-1997: Control of the Obtrusive Effects of Outdoor Lighting

24.7.5 Approvals, permit and licence requirements

A summary of the approvals that may be required for the Project is included in **Table 24-8**. Additional or different approvals, permits or licenses may be required as a consequence of detailed design undertaken prior to construction.

Table 24-8 Summary of approvals

Permit/ approval/ requirement	Legislation	Assessing authority	Trigger/ relevant aspect of the Project	Timing
IDAS approvals – construction				
Development Permit for a Material Change of Use of Premises on contaminated land	Sustainable Planning Act 2009	Chief executive, Department of Environment and Resource Management	Making a Material Change of Use on a property identified on the EMR or CLR.	Prior to undertaking works on EMR/CLR listed properties.
Development Permit for a Material Change of Use of Premises for an Environmentally Relevant Activity	Sustainable Planning Act 2009 Environmental Protection Act 1994	Department of Environment and Resource Management	Undertaking an activity that is identified as being Environmentally Relevant under Chapter 4 of the *Environmental Protection Act 1994*. ERAs could include: - 8 Chemical Storage - 21 Motor Vehicle Workshop Operation - 38 Surface Coating - 43 Concrete Batching - 63 Sewage Treatment - 64 Water Treatment Registration Certificate for the ERAs would be	Prior to undertaking any ERA.

Permit/ approval/ requirement	Legislation	Assessing authority	Trigger/ relevant aspect of the Project	Timing
			required prior to their commencement.	
Development Permit for Operational Works for Taking or Interfering with Water from a Watercourse	Sustainable Planning Act 2009 Water Act 2000	Department of Environment and Resource Management	Taking or interfering with water within a watercourse.	Prior to undertaking works within a watercourse
Development Permit for Operational Works for the Removal of Quarry Material from a Watercourse	Sustainable Planning Act 2009 Water Act 2000	Department of Environment and Resource Management	Removing quarry material from a watercourse.	Prior to removing material from a watercourse for use in the construction process
Development Permit for Operational Works for Constructing or Raising a Waterway Barrier	Sustainable Planning Act 2009 Fisheries Act 1994	Department of Employment, Economic Development and Innovation	Undertaking works that would, or could potentially, create a barrier to the upstream or downstream movement of fish.	Prior to establishing a barrier to the upstream or downstream movement of fish.
Development Permit for Operational Works for Prescribed Tidal Works	Sustainable Planning Act 2009 Coastal Protection and Management Act 1995	Local Government	Undertaking works below the high water mark within a tidal waterway.	Prior to undertaking works within the higher water mark.
Development Permit for Operational Works for the Removal, Destruction or Damage of a Marine Plant	Sustainable Planning Act 2009 Fisheries Act 1994	Department of Employment, Economic Development and Innovation	Any works that involve removal, destruction or damage to marine plants.	Prior to removing, destroying or damaging marine plants.
Non-IDAS approvals – construction				
Licence for an Apparatus or Spectrum (s99 and Chapter 3, Part 3.2)	Radiocommunications Act 1992	Application made to the Australian Communications and Media Authority	Radiocommunications devices must be licensed.	Prior to using radiocommunication devices.
Cultural Heritage Management Plan (s87)	Aboriginal Cultural Heritage Act 2003	Department of Environment and Resource Management	An approved CHMP is required for projects requiring an EIS.	Must be prepared and approved prior to the commencement of construction.
Registration Certificate for an Environmentally Relevant Activity (s73D)	Environmental Protection Act 1994	Department of Environment and Resource Management	Registration certificate must be obtained prior to the commencement of an Environmentally Relevant Activity.	Within a month of obtaining approval for the relevant ERA.
Development by the State on a Queensland	Queensland Heritage Act 1992	Heritage Council (Department of Environment and	Undertaking works on, or adjacent to, a property listed on	Prior to undertaking works within listed properties.

Permit/ approval/ requirement	Legislation	Assessing authority	Trigger/ relevant aspect of the Project	Timing
Heritage Place (s104)		Resource Management)	the Queensland Heritage Register. Approval would not be required if works are undertaken by the State or an exemption notice has been issued.	
Water Licence (ss 808 and 206(5))	Water Act 2000	Department of Environment and Resource Management	Required for taking or interfering with water from a watercourse.	Prior to taking or interfering with water from a watercourse.
Disposal Permit (s424)	Environmental Protection Act 1994	Department of Environment and Resource Management	Required for the removal and treatment or disposal of contaminated soil removed from a property listed on the EMR or CLR.	Prior to removing and treating or disposing of contaminated soil from an EMR/CLR listed property.
Approval for the Storage of Flammable and Combustible Substances (regs 82 and 84)	Dangerous Goods Safety Management Act 2001 Dangerous Goods Safety Management Regulation 2001 Building (Flammable and Combustible Liquids) Regulation 1994	Local Government	Required for the storage of flammable or combustible substances.	Prior to storing flammable and combustible substances.
Agreement of the chief executive to carry out road works on, or to interfere with the operation of, State-Controlled Roads (s33)	Transport Infrastructure Act 1994	Department of Transport and Main Roads	Any works that would impact on the road structure or the intended operation of the State controlled road. Would be required for the any works undertaken to the Pacific Motorway and associated on and off ramps.	Prior to interfering with State Controlled Roads.
Approval of railway manager to interfere with a railway (s255)	Transport Infrastructure Act 1994	Railway manager	Any works that would impact on the railway or the intended operation of the railway.	Prior to impacting the existing railway network.
Rail Feasibility Investigators Authority (s114(2))	Transport Infrastructure Act 1994	Department of Transport and Main Roads	Allows investigator entry and re-entry onto land to investigate potential and suitability as a rail corridor	Prior to gaining entry onto land.

Permit/ approval/ requirement	Legislation	Assessing authority	Trigger/ relevant aspect of the Project	Timing
Approval from chief executive for Ancillary Works and Encroachments	Transport Infrastructure Act 1994	Department of Transport and Main Roads	Required to construct, maintain, operate or conduct ancillary works and encroachments on a State-controlled road.	Prior to undertaking relevant works.
Permit to interfere with controlled vegetation	Urban Land Development Authority (Vegetation Management) Bylaw	Urban Land Development Authority	Required for the removal or interference of controlled vegetation within an Urban Development Area.	Prior to interfering with relevant vegetation.
Permit to interfere with vegetation on roads	Urban Land Development Authority (Vegetation Management) Bylaw	Urban Land Development Authority	Required for the removal or interference of vegetation in road corridors within an Urban Development Area	Prior to interfering with relevant vegetation.
Local Law Permits	City of Brisbane Act 2010 Local Government Act 2009	Local Government	Approvals from the Brisbane City Council under relevant local laws or provisions of the *Local Government Act 2009* may be required prior to the commencement of such activities. Permanent road closures will be required and applied for under the *Land Act 1994*.	Prior to undertaking activities that require local law approval.
Non-IDAS approvals – operation				
Accreditation of Rail Transport Operator	Transport (Rail Safety) Act 2010	Department of Transport and Main Roads	Required for the management of rail infrastructure and rolling stock.	NA
Implementation of Security Management Plan, Emergency Management Plan and various management programs	Transport (Rail Safety) Act 2010	Department of Transport and Main Roads	Management plans and programs must be established for works managed by the Rail Transport Operator.	NA
Ongoing	Transport Security (Counter-Terrorism) Act 2008	Department of Transport and Main Roads	A risk management plan must be prepared and issued to the Chief	NA

Permit/ approval/ requirement	Legislation	Assessing authority	Trigger/ relevant aspect of the Project	Timing
			Executive prior to the prescribed date if the project is declared by the Chief Executive as a Security-Identified Surface Transport Operation.	
Prior to the installation of any permanent facilities.	Plumbing and Drainage Act 2002	Local Government	Required for the installation of any permanent facilities, such as toilets, showers, etc.	Prior to the installation of any permanent facilities.

24.8 Environmental design principles

The following outlines a range of environmental design principles that respond to environmental and community issues identified through the EIS. They seek to manage or mitigate community and/or environmental impacts of the Project's design and operation.

They relate to Cross River Rail only and are to be addressed through the detailed design phase. These principles and guidelines are not intended to over-ride technical design specifications and relate to such matters as:

- Transport and access
- Climate change and sustainability
- Air quality
- Visual amenity and lighting
- Surface water quality
- Flood management
- Noise and vibration
- Land use and planning.

The environmental design principles for consideration during detailed design are described further in **Table 24-9**.

Table 24-9 Environmental design principles

Issue	Environmental design principles
Transport and access	• Emergency access and evacuation for each station and the rail tunnels is designed in consultation with the relevant emergency services authorities. • New and upgraded footpaths and pedestrian walkways in the vicinity of stations are designed, in consultation with Brisbane City Council and emergency services authorities, to allow safe and efficient pedestrian movement during peak periods and, where applicable, major events. • Pedestrian paths in the vicinity of stations are designed in accordance with Queensland Rail's Station Design Guide. • An Equitable Access Statement (EAS) is submitted to the Department of Communities (Disability Service Queensland) at least two months prior to commencement of permanent construction, and the EAS is finalised and implemented within six months of the commencement of construction. The EAS aims to ensure that the access needs of people with a disability are taken account of during the design of the Project.
Climate change and sustainability	• The Project is designed to minimise energy use in both its construction and operation. • The Project design minimises reliance on potable water supplies during its construction and operation. • Project stations are designed and constructed in accordance with Queensland Rail's Station Design Guide requirements for environmentally responsive design.
Visual amenity and lighting	• Project stations are designed in accordance with Queensland Rail's Station Design Guide. • The design of Project stations and their environs provide a consistent and integrated urban design and landscaping approach, based on a water-wise, sub-tropical theme. • Other Project infrastructure, such as rail viaducts and pedestrian bridges, ventilation buildings and noise barriers, is designed to integrate with the existing landscape and streetscape. • The design of pedestrian and cycle pathways and public spaces incorporates crime prevention through environmental design (CPTED) principles. For consistency with the setting of Project infrastructure, the CPTED principles adopted for Cross River Rail are generally consistent with the CPTED guidelines outlined in Queensland Rail's Station Design Guide. • The design of public spaces developed as part of the Project stations supports neighbourhood identity. • Project lighting is designed in accordance with Australian Standard AS4282-1997 'Control of the obtrusive effects of outdoor lighting' and Queensland Rail's Lighting Standard for Railway Stations. • Park 'n' ride and kiss 'n' ride facilities and vehicle access to stations are designed and sited to avoid headlight glare intruding into nearby sensitive receptors.

Land use and tenure	• The Project design is integrated, to the extent reasonable and practicable and within Project timeframes, with planned urban development areas, at Bowen Hills and Woolloongabba, transit oriented development sites at Yeerongpilly, and the Boggo Road Urban Village
	• The Project design minimises:
	  • the loss of pre-1946 character housing, particularly at Yeerongpilly, to the extent reasonable and practicable
	  • where practicable, the loss of retail space within the CBD through the provision of retail space within the Albert Street station
	  • the extent of land required within Victoria Park for temporary construction worksite.
	• The Project design is developed and implemented in consultation with:
	  • The RNA and Lend Lease with regard to the design, access, heritage and construction schedules of the Project and RNA Showgrounds redevelopment to assist in managing potential impacts for both projects.
	  • Brisbane City Council in relation to the relocation of Council's Local Asset Services central compound at Gregory Terrace, Spring Hill.

Issue	Environmental design principles
	• Key stakeholders in relation to the future development of the Bowen Hills and Woolloongabba UDAs (ULDA), Boggo Road Urban Village (DPW and Leighton) and Yeerongpilly TOD (Department of Planning and Local Government) to achieve increased transport and land use integration.
Air quality	• Ventilation outlets are designed and sited so as not to cause an increase in air temperature at nearby sensitive receptors or at ground level.
Noise and vibration	• The Project is designed to achieve the Queensland Rail Code of Practice for Railway Noise Management referenced in the draft Outline EMP (Operations), for all sensitive receptors during the operational phase. • The Project is designed to achieve the environmental objectives with regard to the effects of operational noise and ground-borne vibration generally, as identified in the draft Outline EMP (Operations). • Specifically, public address systems, bus stops, 'kiss 'n' ride', car parking, ventilation systems and electricity feeder stations at or near stations, and rail stabling yards are designed and sited to achieve the environmental objectives for the acoustic environment during the operation phase.
Waste management	• The Project is designed to minimise waste generation and maximise the reuse and recycling of waste materials generated by the Project during its construction and operation. • The Project design facilitates the use of recycled materials in its construction and operation. • Opportunities are investigated during the detailed design phase for the use of recycled materials, including for Project infrastructure produced from concrete, road base, asphalt and other construction materials. • During detailed design, the feasibility of re-using material excavated from the Project is investigated.
Flood management	• The Project design is based on detailed flood modelling to avoid or minimise changes in flood levels, including under a climate change scenario. • The Project design provides flood immunity to the tunnel infrastructure in an extreme flood event (ie 1 in 10,000 AEP event). • If car parking areas are to be provided for the Project, in its operation mode, they are designed and sited to avoid or minimise the potential for vehicles to impede water flow during high rainfall events.

24.9 Draft Outline EMP (Construction)

This section describes the environmental objectives and performance criteria for each environmental element relevant to the construction of the Project. Mitigation measures to achieve the environmental objectives and performance criteria are also recommended. Specific monitoring requirements and/or statutory requirements are also outlined for some environmental elements.

The elements relevant to the draft Outline EMP (Construction) are:

- General construction
- Traffic and transport
- Topography, geology, geomorphology and soils
- Land contamination
- Groundwater
- Surface water quality
- Flood management
- Air quality
- Land use (property access)
- Noise and vibration
- Nature conservation
- Cultural heritage
- Visual and landscape amenity and lighting
- Community engagement
- Economics
- Waste management
- Climate change and sustainability

- Hazard and risk.

Table 24-10 Element 1 – General

<table>
<tr><th colspan="2">Element 1 – General – construction</th></tr>
<tr><td>Environmental objective</td><td>• Construction works avoid or minimise impacts of the Project on the environment and the community.</td></tr>
<tr><td>Performance criteria</td><td>• Construction activities are undertaken in accordance with the hours of work outlined in Hours of Work table in this draft Outline EMP (Construction).
• Work areas are prepared in accordance with the designs providing for the management and mitigation of construction impacts.
• Construction works are planned and managed to avoid, mitigate or manage impacts on amenity, buildings and property and environmental conditions near to construction works.
• Construction activities are managed to maintain public safety near construction works and along haulage routes.
• Exceedances of goals for noise and vibration are minimised, mitigated and managed.</td></tr>
<tr><td>Mitigation measures</td><td>• Construction activities are to be undertaken in accordance with the hours of work outlined below.
Hours of work
<table>
<tr><th>Worksite</th><th>Surface works – standard hours*</th><th>Works conducted underground or within an acoustic enclosure, providing the environmental objectives are achieved</th><th>Spoil haulage and materials/ equipment delivery*, providing the environmental objectives are achieved</th></tr>
<tr><td>Northern Portal (Victoria Park), Boggo Road</td><td>• 6.30 am – 6.30 pm, Monday to Saturday
• no work on Sunday or public holidays</td><td>24 hours, 7 days</td><td>• 6.30 am Monday – 6.30 pm Saturday
• No work Sunday or public holidays</td></tr>
<tr><td>Yeerongpilly
Clapham Rail Yard
Woolloongabba
Mayne Rail Yard</td><td>• 6.30 am – 6.30 pm, Monday to Saturday
• no work on Sunday or public holidays</td><td>24 hours, 7 days</td><td>24 hours, 7 days</td></tr>
<tr><td>Roma Street, Albert Street</td><td>• 6.30 am – 6.30 pm, Monday to Saturday
• 6.30 pm – 10.00 pm Monday to Friday
• no work on Sunday or public holidays</td><td>24 hours, 7 days</td><td>• 6.30 am – 10.00 pm, Monday to Friday
• 6.30 am- 6.30 pm Saturday
• no haulage on Sundays or public holidays</td></tr>
<tr><td>Surface roadworks at:
• O’Connell Terrace
• Rocklea (Ipswich Motorway)</td><td>• 6.30 am– 6.30 pm Monday to Saturday
• 6.30 pm – 10.00 pm Monday to</td><td>n/a</td><td>• 6.30 am Monday – 6.30 pm Saturday
• 6.30 pm – 10.00 pm Monday to</td></tr>
</table></td></tr>
</table>

Element 1 – General – construction

	Friday • No work Sunday or public holidays		Friday • No work Sunday or public holidays
Other worksites: • Fairfield ventilation and emergency access building • Salisbury, Rocklea station, Moorooka station • RNA Showgrounds and Exhibition station	• 6.30 am – 6.30 pm, Monday to Saturday • no work on Sunday or public holidays	24 hours, 7 days	• 6.30 am – 6.30 pm, Monday to Saturday • no haulage on Sundays or public holidays

* Note: works may be undertaken outside of these hours in the following special circumstances:
  - Works undertaken within a road reserve that cannot be undertaken reasonably nor practicably during standard hours due to potential disruptions to peak traffic flows.
  - Works undertaken within a rail corridor that cannot be undertaken reasonably nor practicably during standard hours due to potential for disruption to rail services.
  - Works involving the transport, assembly or decommissioning of oversized plant, equipment, components or structures.
  - Emergency works to avoid the loss of lives, damage to property or to prevent environmental harm.
- Materials and equipment deliveries include the delivery of 'in time' materials such as concrete, hazardous materials, large components and machinery.
- Construction worksites and work areas are designed and managed to minimise construction impacts, including, but not limited to, the use of:
  - Work sheds over tunnel portals and shafts where large quantities of spoil and construction materials are to be handled. Such sheds include acoustic lining, ventilation and dust filtration to achieve environmental objectives and performance criteria for noise and air quality set out in this draft Outline EMP (Construction).
  - Enclosures for spoil and materials handling, storage and loading, which are designed and constructed to achieve environmental objectives and performance criteria for noise and air quality as set out in this draft Outline EMP (Construction).
  - Night lighting, including security lighting, which is designed, installed and positioned to avoid light spill onto residential properties at intensities exceeding 8 lux, measured at the boundary of the residential property.
  - Solid (but not see-through) fencing to work area boundaries to ensure safety for pedestrians and cyclists and minimise distractions for motorists. These may also be used to provide noise attenuation.
- Access to construction worksites for pedestrians and vehicles is to satisfy the City Plan 2000 Transport, Access, Parking and Servicing Code.
- Rehabilitation of construction work areas is to be undertaken progressively and as soon as practicable to minimise potential impacts of dust, soil erosion and sedimentation.
- Water supply or other infrastructure services required to support construction works are to be designed and constructed to achieve the environmental objectives and performance criteria set out in this draft Outline EMP (Construction).
- Where damage to property occurs as a consequence of construction works, the damage is to be repaired by the Contractor as soon as practicable and without cost to the property owner. Repairs are to be undertaken in consultation with the property owners and occupants and must return the premises at least to the condition existing prior to the commencement of construction works.

Element 1 – General – construction	
Monitoring	• Continuous, or as required otherwise by this draft Outline EMP (Construction).
Reporting	• Weekly during site preparation, establishment and construction start-up and then monthly until completion of construction and for six months following rehabilitation.

Table 24-11 Element 2 – Traffic and transport

Element 2 – Traffic and transport – construction	
Environmental objectives	Construction traffic and transport is planned and managed to: • minimise impacts, including delays and disruptions, to rail services and operations • minimise impacts on the operation of the road network • minimise impacts on the community and safety • maintain access to properties, particularly residential and commercial properties • maintain the existing availability of residential and commercial car parking, near construction worksites.
Performance criteria	• Disruptions to the operation of passenger and freight rail services, the road network and the public transport network due to construction works are avoided during peak periods and minimised during off-peak periods. • Passenger rail services and schedules during peak travel times are maintained. • Key freight rail services and key schedules nominated by the rail network manager are maintained. • Haulage vehicles (ie spoil haulage, fill haulage, construction equipment and associated material haulage) only travel on designated construction routes defined in this draft Outline EMP (Construction) (refer to **Figure 24-1**), unless approved by the relevant traffic authority. • Local roads are not used by construction vehicles, unless approved by the relevant traffic authority in consultation with the local community serviced by such roads. • Traffic flows near construction works are maintained during peak traffic periods and managed during off-peak periods to minimise disruption. • Construction traffic is managed and worker parking is provided in sufficient numbers and managed to avoid impact on communities near to construction worksites. The provision of workers' car parking is not dependent on local suburban streets. • Information about the timing and scale of changes to traffic and transport conditions on passenger rail operations and the road network in the vicinity of construction works is provided in good time to the local community, commuters and on request to other people interested in the construction works. • Safe access is maintained for passers-by and for passengers to and from public transport facilities, including rail stations, busway stations and bus stops. • Pedestrian and cycle access to community facilities is not disrupted by construction works, unless approved by the relevant traffic authority in consultation with the manager of the community facilities.
Mitigation measures	**Rail services** • Rail network shutdowns are to be agreed with Queensland Rail through the Scheduled Closure Access System, prior to the commencement of works within the rail corridor, to minimise disruption to the rail network. • Early and on-going notification is to be provided to Queensland Rail, rail passengers, rail freight operators and local communities of the timing and duration of rail shutdowns, likely disruptions to rail services and alternative arrangements to be implemented. • Bus replacement services are to be provided where passenger rail operations are interrupted, such as during rail network shutdown periods or temporary closures of Exhibition, Yeerongpilly, Moorooka, Rocklea and Salisbury stations. • Disruption to rail passenger services is to be avoided to the extent reasonable and practicable during major events, such as the Ekka (Exhibition Station), the Brisbane International tennis tournament (Yeerongpilly Station) and at Suncorp Stadium (Roma Street Station). Where disruptions are unavoidable, bus shuttle services are provided between appropriate stations to the major event venues, or to bypass the disrupted section in the network.

Element 2 – Traffic and transport – construction	

	• Pedestrian access for Queensland Rail staff between Mayne Rail Yard and Bowen Hills Station is to be maintained.
	• Road access to and within Mayne Rail Yard is maintained during construction works.
	• To the extent reasonable and practicable, existing access to the rail corridor for maintenance and emergency service vehicles is to be maintained. Where necessary, alternative access arrangements are to be provided in consultation with Queensland Rail and other rail operators.
	Construction traffic and construction site access
	• Prepare and implement a Construction Traffic Management Plan, in consultation with the Department of Transport and Main Roads and Brisbane City Council, which identifies measures to avoid, or mitigate and manage impacts of construction traffic on local communities, transport networks and the environment. This is prepared prior to the commencement of construction and is to address, but not be limited to, the measures outlined below:
	  • Designated truck routes and arterial roads for the haulage of construction materials and spoil. Designated truck routes to and from construction worksites are shown in Figure 24-1 of this draft Outline EMP (Construction).
	  • Where special circumstances require the use of other truck routes, such as the delivery or removal of oversized plant, equipment or structures, construction traffic is managed in accordance with specific traffic management sub-plans prepared in consultation with relevant traffic and transport agencies.
	  • The use of local streets for construction vehicle access is minimised through the provision of direct worksite access to/from arterial roads where practicable.
	  • Construction haulage tasks are scheduled and managed to minimise disruption to traffic flows during peak traffic periods.
	• Construction haulage tasks avoid the hours of 7.30 am to 9.30 am and 2.00 pm to 4.00 pm on school days, at the following locations:
	  • Gregory Terrace, west of Rogers Street, at Spring Hill
	  • Annerley Road, north of Peter Doherty Street, at Dutton Park.
	• Haulage tasks avoid peak traffic periods, being 7.00 am to 9.00 am and 4.00 pm to 6.00 pm, Monday to Friday, at the following locations:
	  • the Brisbane CBD
	  • at Woolloongabba, Stanley Street in the morning peak, and Vulture Street in the afternoon peak.
	• As far as practicable, major haulage tasks for worksites are avoided during the following scheduled major events:
	  • the Ekka and other significant events at the RNA Showgrounds, for the RNA worksites
	  • events at the Gabba Stadium, for the Woolloongabba worksite
	  • Brisbane International tennis tournament at the Queensland Tennis Centre, for the Yeerongpilly worksite
	  • various events at Roma Street Parkland, for the Roma Street Station worksite
	  • events at Suncorp Stadium, for the Roma Street Station worksite.
	• Haulage routes and haulage activities are coordinated with major construction works for other major projects near to construction activities, including at the:
	  • RNA Showgrounds and Bowen Hills UDA
	  • Woolloongabba UDA
	  • Boggo Road urban village
	  • Yeerongpilly transit oriented development.
	• The capacity of intersections along haulage routes is investigated and mitigation measures implemented, to minimise the impact of construction vehicles so as to maintain the pre-existing level of service (LOS) on intersection operations.
	• Truck movements are to be managed to avoid impacts on the local streets approved for use such as damage to road pavements, from heavy vehicle traffic. Damaged road

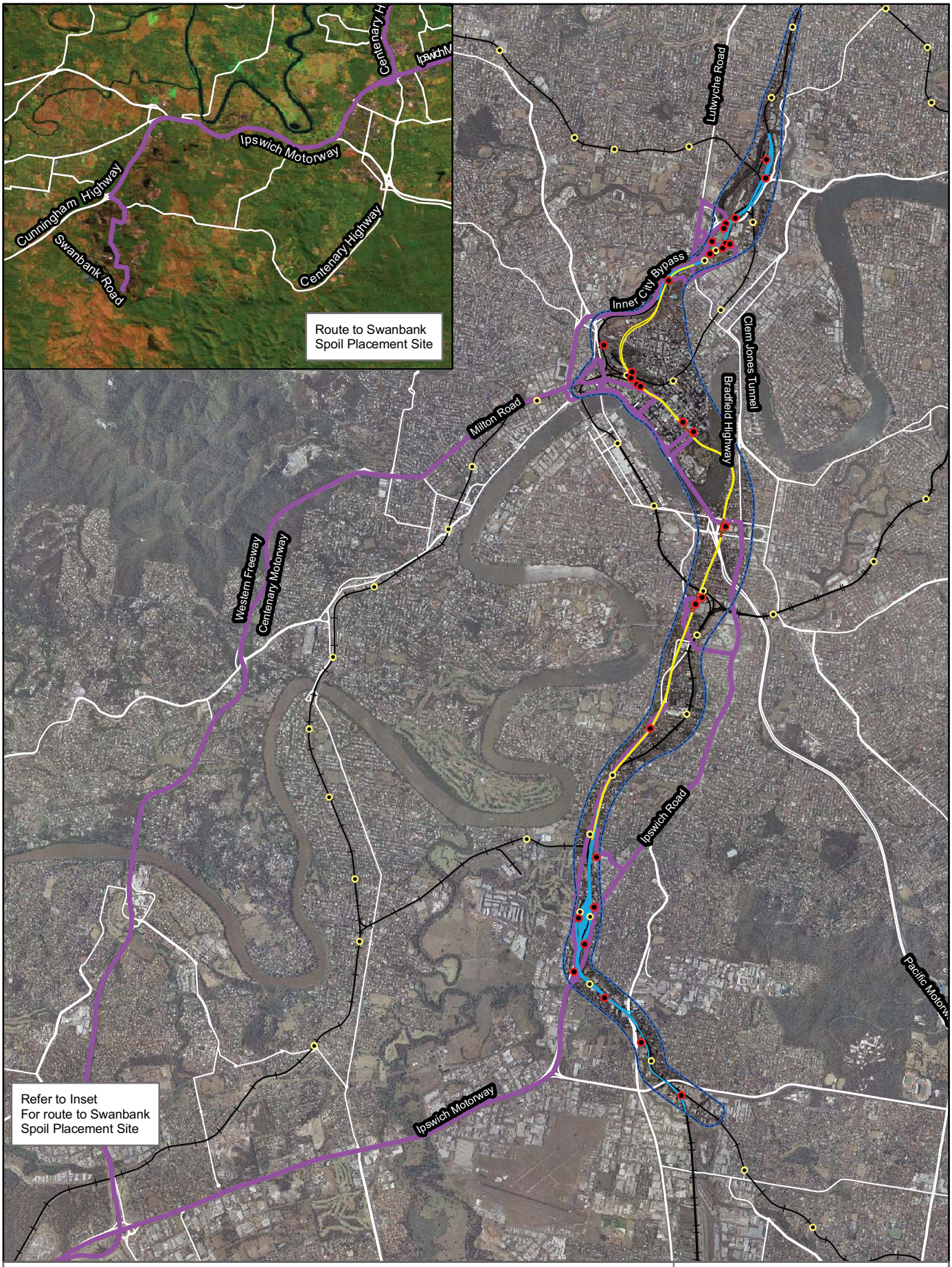
Element 2 – Traffic and transport – construction	

	pavements are to be repaired by the Proponent (or its agent or contracted entity) periodically to maintain traffic safety, traffic amenity and pre-existing levels of service. Generally where impacts occur, the relevant traffic and road management agencies are to be consulted to devise and agree appropriate mitigation measures.
	• Prepare and implement in consultation with local communities, the Department of Transport and Main Roads and Brisbane City Council, a construction workforce car parking plan for each construction worksite, to provide sufficient parking and travel arrangements for the construction workforce, and to avoid the impacts on car parking and access in streets near to construction worksites. This car parking plan is to be prepared and implemented prior to the commencement of construction works.
	• Prepare and implement, prior to the commencement of construction works, a Construction Vehicle Management Sub-plan, which provides measures to manage the operation of the construction truck fleet, including, but not limited to:
	  • real-time monitoring of truck position, speed, route and performance in relation of traffic conditions and schedule requirements
	  • managing truck speed and position to avoid queuing near construction worksites and sensitive community facilities and residential neighbourhoods
	  • managing traffic signals on nominated spoil haulage routes in night-time hours to achieve optimum performance of the truck fleet and to minimise impacts on communities along the designated routes
	  • maintaining all haulage vehicles to a high standard (ADR28/01) in relation to noise emissions, exhaust emissions, traffic safety and operational safety
	  • ensuring all vehicles leaving a construction worksite pass over or through devices that remove soil and other materials before entering the road.
	Road traffic and access
	• In conjunction with the Department of Transport and Main Roads, Brisbane City Council and emergency service providers, identify and implement measures to manage traffic flows and ensure safe traffic movement near construction works.
	• Local communities and road users are to be notified of proposed changes to local traffic access arising from Project works. This includes, but is not limited to, the provision of clear signage identifying changed traffic conditions, and public advertisements (local and regional newspapers, Project website) describing the proposed changes, the duration of the changes, and possible alternative routes to avoid the impacts of the proposed changes.
	• Project works in or near road corridors are to be screened with solid barriers to minimise distractions for motorists.
	• Access to properties adjoining or near to Project works, is maintained. Where changes to property access are required, alternative access arrangements are to be identified in consultation with property owners and occupants.
	• Access for delivery vehicles to local businesses near Project works is to be maintained. Where changes to access for delivery vehicles are required, alternative access arrangements are to be identified in consultation with local businesses. In particular, access for delivery vehicles is to be maintained to businesses:
	  • at O'Connell Terrace, Bowen Hills
	  • at Roma Street, Albert Street, Alice Street and Mary Street in the Brisbane CBD
	  • at Allen Street, Stanley Street and Vulture Street at Woolloongabba
	  • at Boggo Road Urban Village off Annerley Road, Dutton Park
	  • in the industrial area between Ipswich Road and Moolabin Creek at Moorooka
	  • in the area between Fairfield Road and Clapham Rail Yard, Yeerongpilly.
	  • two lanes of traffic are to be retained in each direction on Fairfield Road during peak periods.
	• Access for emergency services vehicles is to be maintained for the duration of construction works to:
	  • Royal Brisbane and Women's Hospital (RBWH) via O'Connell Terrace
	  • Princess Alexandra Hospital (PAH), via Cornwall Street
	  • Mater Hospital, via Stanley Street.

Element 2 – Traffic and transport – construction	

	Public and active transport
	• Traffic management measures are to be implemented near to Project works to minimise disruption and delays to bus services.
	• Safe and functional access for pedestrians and cyclists is to be maintained near Project works, including for the elderly, children and people with mobility difficulties including vision and hearing impairments. This measure is to consider relevant Crime Prevention through Environmental Design (CPTED) principles.
	• Safe and functional pedestrian and cycle access is to be maintained to public transport facilities near Project works. This measure would address the needs of children, elderly and people with mobility difficulties including vision and hearing impairments. In particular, access is to be maintained to:
	  • Exhibition Station and RNA Showground facilities, during Ekka events
	  • Bowen Hills Station, including along O'Connell Terrace from the RBWH
	  • Roma Street Station from Roma Street and from the Roma Street Parkland
	  • City Gardens, QUT and the parliamentary precinct
	  • CBD streets including Albert Street, Mary Street, Margaret Street and Alice Street
	  • Woolloongabba busway station
	  • Park Road Station and Boggo Road busway station, particularly to/from the Boggo Road urban village
	  • Yeerongpilly Station
	  • Rocklea and Salisbury Stations.
	• Bus replacement services are to be provided when passenger rail operations are interrupted, (eg during rail network shutdown periods or temporary closures of Exhibition, Yeerongpilly, Moorooka, Rocklea and Salisbury Stations).
	• Safe pedestrian and cycle access is to be maintained near construction works to community facilities, such as schools, child care facilities, churches, aged care accommodation, open space, sport and recreation, health care and shopping facilities. This is to consider the particular needs of children, elderly and people with mobility difficulties, including vision and hearing impairments. In particular, access is to be maintained to:
	  • RNA Showgrounds during events at this location
	  • Royal Brisbane and Women's Hospital
	  • Open space areas that are not occupied by Project work sites, such as Victoria Park, Roma Street Parkland and City Botanic Gardens
	  • Schools near to Project works, such as Brisbane Girls Grammar School, St Josephs College, Brisbane Grammar School, Dutton Park State School and Nyanda State High School
	  • Grosvenor Hall Child Care centre
	  • Churches such as St Fabians Church at Yeerongpilly.
	• Where pedestrian and cycle access to community facilities is changed, local access strategies are to be developed in consultation with local communities, community facility managers and relevant stakeholder groups, including Vision Australia.
	• Safe, alternative access is to be provided for bikeways disturbed by construction works, including but not limited to:
	  • the bikeway in Victoria Park
	  • the bikeway through Roma Street Parkland.
	• Local communities, including but not limited to, residents, businesses, users of community facilities and public transport passengers, are to be notified about changes to pedestrian and cycle access near construction works, and public advertisements (local and regional newspapers, Project website) describing the proposed changes, the duration of the changes and possible alternative routes to avoid the impacts of the proposed changes.

Monitoring	• Monitoring of construction traffic to ensure compliance with relevant requirements of Brisbane City Council, Department of Transport and Main Roads, Police and Queensland Rail. • Traffic flows near construction worksites are to be regularly monitored and traffic management measures reviewed, to address local traffic issues.
Reporting	• Monthly reporting on local traffic and transport conditions, including any accidents involving construction traffic.



LEGEND

- Study Corridor
- Station
- Track
- Underground Station

Alignment

- Above Ground
- Underground

- Haul Route
- Worksite

CROSS RIVER RAIL
ENVIRONMENTAL IMPACT STATEMENT

Figure 24-1

Combined Haulage Routes

0 1 2 3 4 Km

1:75,000 at A4

N

CrossRiverRail

SKM aurecon CRR JOINT VENTURE

Map by: MJS K:\Cross River Rail\600 Environment\619 GIS\Aurecon\205555_CRR\G0114_CRR_Haulage_Routes_A4_EMP.mxd 08/07/2011 14:05

Table 24-12 Element 3 – Topography, geology, geomorphology and soil

Element 3 – Topography, geology, geomorphology and soils – construction	
Environmental objectives	• Avoid or minimise impacts of settlement from tunnelling or other construction activities. • Minimise the risk of soil erosion at Project worksites. • Avoid or manage impacts from soil erosion and sedimentation from Project works on the environmental values of the Brisbane River and other waterways within the study corridor. • Avoid or manage the environmental and public health risks associated with working in potential ASS encountered during construction works. • Maximise the recovery of spoil for re-use in the Project or for recycling.
Performance criteria	• Settlement consequential to Project works does not impact on the structural integrity of buildings or infrastructure. • No adverse impacts occur to the environmental values of Breakfast / Enoggera Creek, Brisbane River, Oxley Creek, Moolabin Creek, Rocky Waterholes Creek or Stable Swamp Creek as a result of soil erosion and sedimentation associated with Project works. • ASS is avoided, or if intercepted, ASS is managed to ensure no adverse impact to environmental values, infrastructure, construction equipment, construction personnel or the public. • A monitoring and recording mechanism is developed and implemented for spoil management, including separation, treatment, re-use and disposal.

Mitigation measures	**General**
	• Soil erosion and sediment controls are to be developed and implemented for each work area in accordance with the Queensland Engineers guideline for sediment control[1].
	• Manage on-site spoil stockpiling, treatment, re-use and off-site removal and disposal at spoil placement sites.
	• Conduct induction and training for construction personnel regarding procedures for managing ASS, soil erosion and sediment mobilisation, and environmental and compliance monitoring.
	Settlement
	• Undertake detailed geotechnical and groundwater investigations and modelling of sub-surface conditions along the tunnel alignment and at underground stations to inform detailed design and construction planning.
	• Identify the potential for settlement impacts, including:
	  • excavation induced settlement
	  • groundwater drawdown induced settlement
	  • local ground relaxation settlement.
	• Undertake predictive modelling, based on ANSETTLE to identify the settlement trough footprint, within which predicted settlement would lead to property damage, including building damage and cosmetic damage.
	• Where the predictive modelling indicates property damage is likely as a consequence of the Project works, undertake with the consent of owners, a building condition survey of buildings, structures and significant landscaping works and heritage landscape features.
	• Where predictive modelling indicates groundwater impacts are likely, construction measures are to be designed and implemented to manage and mitigate the identified impacts.
	• Where predictive modelling indicates settlement may be likely, design and construction measures are to be implemented to manage and mitigate the identified impacts.

[1]Chapman GA and Atkinson G, 2000, *Soil and Sediment Control: Engineering Guidelines for Queensland*. Society of Civil Engineers

Element 3 – Topography, geology, geomorphology and soils – construction	

	• Detailed design and construction planning is to incorporate measures to limit settlement generally to 25 mm or to 50 mm in a worst case event, measured at any location within 50 m of the route centreline or the outer walls of an underground station or excavated structure.
	• Monitor and review the settlement management measures from the commencement of construction works. In particular, monitoring to be undertaken at, but not limited to, the following locations:
	  • Albert Street Station
	  • Gabba Station
	  • Boggo Road Station
	Soil erosion
	• To inform detailed design and construction planning, undertake soil and sub-surface soil sampling as part of the geotechnical investigations, to identify and characterise vulnerable soils in areas of proposed surface works. In particular, sampling to be undertaken at, but not limited to, the following locations:
	  • between Mayne Rail Yard and Exhibition Station
	  • northern portal and associated construction worksite
	  • Albert Street Station and Albert Street south construction worksite
	  • southern portal, new Yeerongpilly Station and Yeerongpilly construction worksite
	  • between the new Yeerongpilly Station and Clapham Rail Yard.
	• Prior to the commencement of any construction works, determine the design rainfall event for measuring, managing and monitoring soil erosion and sedimentation consistent with relevant guidelines.
	• Prior to the commencement of any construction works, develop and implement mitigation measures for each construction worksite and location of surface works, to limit the risk of erosion. Mitigation measures are to minimise:
	  • sediment entrained in surface runoff
	  • loss of topsoil during site preparation and from stockpiling for extended periods
	  • erosion due to vegetation clearing and soil disturbance
	  • erosion of exposed vulnerable soils by wind or water action.
	• Prior to the commencement of construction works, at each worksite and location of surface works, undertake a erosion risk assessment to quantify the erosion potential for each soil type likely to be disturbed during construction and identify flow paths, suitable stockpile locations, soil cover type, soil stability and high risk soils.
	• Plan construction works to provide for the progressive and timely stabilisation and rehabilitation of disturbed areas.
	• Maintain erosion and sediment control structures, including during site clearing and establishment, construction and rehabilitation works and if required, repair and replace after rainfall events.
	• Undertake progressive landscaping and stabilisation works for on-going sediment control at construction sites throughout and immediately following construction.
	Acid sulphate soils
	• To inform detailed design and construction planning, undertake ASS investigations in accordance with the current QASSIT[2] guidelines in areas below five metres AHD, where proposed excavation or soil disturbance is to occur, including at, but not limited to, the following locations:
	  • Mayne Rail Yard
	  • Ekka Station
	  • area adjacent to the Inner City Bypass (ICB), identified for the feeder stations

[2] Queensland Acid Sulphate Soils Investigation Team, Department of Environment and Natural Resources

Element 3 – Topography, geology, geomorphology and soils – construction	
	• Albert Street Station and construction worksites • at works adjacent to Moolabin Creek • Clapham Rail Yard. • Prepare and implement site specific ASS Management Plans for all areas of ASS disturbance, which include corrective actions for incident management and remediation. • Take all reasonable and practical measures to identify the potential for and to then avoid or minimise, monitor and manage the impacts and risks of: • disturbing vulnerable surface and subsurface soils • disturbing ASS by construction works including excavation, filling and groundwater drawdown.
Monitoring	**Settlement** • Prior to the commencement of nearby construction, establish baseline conditions, including levels at premises indicated by predictive modelling to be susceptible to settlement. • Monitor the effects of settlement if any, from tunnelling and excavations for underground stations and associated infrastructure, including through surveys and displacement monitoring. **Soil erosion** • Monitor sediment and erosion control structures and measures and review management measures weekly during site clearing and establishment, construction and rehabilitation. • Monitor daily during rain events or when using large quantities of water in construction works. • Inspect surface soil stabilisation measures monthly during the post-construction maintenance phase. • After rainfall events, inspect drainage discharge points from each worksite for evidence of sediment transport, if any. **Acid sulphate soils** • For construction works involving ASS, monitor weekly receiving waters predicted to be influenced by drainage from a worksite or construction works involving ASS or PASS. • Monitor weekly for the presence of flocculation of iron in surface water drains, mortality of aquatic flora and/or fauna in adjacent waterways, visible corrosion of concrete structures. • Monitor monthly groundwater and surface water in areas hydraulically connected to sites of ASS disturbance.
Reporting	• For soil erosion and sedimentation, and for acid sulphate soils - monthly until completion of construction and during the post-construction maintenance phase. • For settlement – quarterly reporting until completion of construction and during the post-construction maintenance phase (to be determined in the construction contract documents).

Notes:

1. *IECA (2008) – Best Practice Erosion and Sediment Control (International Erosion Control Association) ICA Australasia November 2008*
2. *EPA (2008) – EPA Guideline – EPA Best Practice Urban Stormwater Management: Erosion and Sediment Control*

Table 24-13 Element 4 – Land contamination

Element 4 – Land Contamination – Construction	
Environmental objective	• Avoid or manage the environmental and public health impacts and risks from contaminated soil, groundwater or soil gas intercepted during construction works.
Performance criteria	• Works are conducted in accordance with the *Draft Guidelines for the Assessment and Management of Contaminated Land in Queensland*, 1998 and NEPM (Assessment of Site Contamination) (including variations to the NEPM approved by DERM). • No disturbance of contaminated soil occurs until approved management plans are in place. • Handling of asbestos occurs in accordance with relevant legislation, regulations, guidelines and/or procedures.

Element 4 – Land Contamination – Construction	
	• Avoid contamination from the storage, use or management of hazardous materials used for construction.

Mitigation measures	• Undertake site history investigations, as part of a preliminary site investigation, to ascertain areas within the study corridor subject to soil, groundwater or soil gas contamination, These investigations are to be undertaken by a person suitably qualified in accordance with the EP Act and are to be undertaken for, but not limited to:
	  • works within or adjacent to the existing rail corridor
	  • northern tunnel portal
	  • Roma Street Station
	  • Albert Street Station
	  • Gabba Station
	  • southern tunnel portal
	  • construction worksites and material storage and lay-down areas at Yeerongpilly and Salisbury
	  • Ipswich Motorway on-ramp reconfiguration at Rocklea
	  • surface works and footbridge at Salisbury
	  • Lillian Avenue and Dollis Street road works.
	• Prior to the commencement of construction, develop and implement a contaminated land management procedure, which includes, but is not limited to:
	  • identification of the likely forms of contamination that could occur (eg fuels, oils, paints, etc.)
	  • procedures for the appropriate storage of hazardous materials in compliance with relevant standards
	  • measures to prevent land contamination during construction
	  • procedures for identifying, investigating and managing unforeseen contamination
	  • spill response and remediation procedures
	  • a listing of properties on the EMR in accordance with the EP Act
	  • measures for the management, remediation and disposal of contaminated soil and/or spoil generated from properties listed on the EMR/CLR
	  • post-construction management and/or monitoring requirements
	  • disposal permits obtained from DERM for the removal of contaminated soil in accordance with the EP Act, as required.
	• Notify the DERM of any land parcels containing contaminated soil that are not listed on the EMR/CLR or that have a history of notifiable activities that are not previously notified to DERM.
	• While handling contaminated soils, conduct dust monitoring at adjacent properties to assess levels of dust generation that may affect nearby sensitive receptors.
	• Develop and implement, prior to the commencement of demolition works and construction, measures for the management of asbestos. Measures are to be in accordance with:
	  • *Environmental Protection Act 1994*
	  • *Workplace Health and Safety Act 1995*
	  • *Workplace Health and Safety Regulation 2008*
	  • National Code of Practice for the Management and Control of Asbestos in Workplaces and National Code of Practice for the Safe Removal of Asbestos (2nd Edition) [NOHSC: 2002 (2005)]
	  • Other legislation, regulations, guidelines or policies.
	• Prior to the partial or full demolition of any buildings or structure, undertake an asbestos audit of the building or structure.
	• Where asbestos is suspected in fill materials, cease works until analytical testing confirms the presence or absence of asbestos. If asbestos is present, implement appropriate management measures for asbestos containing materials.

Element 4 – Land Contamination – Construction	

	• Develop and maintain an appropriate hazardous materials register for each worksite as required by Occupational Health and Safety (OH&S) and other regulations or guidelines, to include:
	  • storage location
	  • storage requirements
	  • Information on the proper use
	  • handling information
	  • disposal procedures.
	• Develop and maintain material safety data sheets for all materials and chemicals included in the hazardous materials register and store hazardous materials in accordance with relevant material safety data sheets and relevant Australian Standards.
	• Design chemical and fuel storage areas to comply with Australian Standards, including AS1940: Storage and Handling of Flammable and Combustible Liquids, 2004 and AS3780: The Storage and Handling of Corrosive Substances, 2008.
	• Develop prior to the commencement of construction and implement as required, incident management plans, which outline procedures for containing and cleaning-up accidental spillage of fuels and other hazardous materials.
	• Ensure spills and leaks are cleaned-up and remediated as quickly as possible and in accordance with the incident management plans.
	• Develop and implement, prior to the commencement of construction, a construction OH&S plan, which outlines procedures for managing exposure of construction workers to potential contaminants in soil and/or water.
	• Locate spill response and containment equipment at worksites, in close proximity to storage and handling areas.
	• Undertake refuelling and maintenance activities in designated bunded areas to avoid the potential for soil and water contamination.
	• Conduct induction and training for construction staff in relation to:
	  • the management and remediation of contaminated land
	  • procedures for the handling, storage and disposal of hazardous materials
	  • incident response practices and procedures
	  • environmental awareness to encourage good material handling practices, spill management and incident reporting.

Monitoring	• Routine monitoring as required. • Immediate reporting of an incident, spill or other uncontrolled release of contaminants to the environment.
Reporting	• Prepare contaminated land investigation reports, in accordance with relevant legislative guidelines for inclusion in the next annual Project environmental report.

Table 24-14 Element 5 – Groundwater

Element 5 – Groundwater – construction	
Environmental objectives	• Groundwater quality is maintained at pre-disturbance levels during and after construction. • Groundwater inflow to tunnels and underground stations and shafts is minimised.
Performance criteria	• Groundwater inflow during construction is contained to 10 litres per second or less, while post-construction, groundwater inflow is contained to 5 litres per second or less. • Contamination of groundwater by construction materials is avoided. • Groundwater inflows to construction areas, including excavations, are captured and treated to achieve Brisbane River Water Quality (BRWQ), prior to release to the stormwater system.

Mitigation measures	• Prior to the commencement of construction, a water quality monitoring program must be established using the following guidelines:
	  • *Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2000*
	  • *Queensland Water Quality Guidelines 2009*

Element 5 – Groundwater – construction

- *Monitoring and Sampling Manual 2009 Environmental Protection (Water) Policy 2009*

- Groundwater must not be released from construction areas to receiving waters in exceedance of groundwater quality values identified in the Groundwater Quality Values table.

Groundwater Quality Values

Water Quality Indicator	Value
Physico-Chemical	
pH	6.5-8.5
Dissolved Oxygen	80-100% saturation
Total phosphorus	0.06 mg/L
Total nitrogen	0.45 mg/L
Chlorophyll-a	0.01 mg/L
Turbidity	<20 NTL
Suspended Solids (combined wet and dry flows)	50 mg/L
Suspended Solids (wet weather flow)	90%ile <100mg/L
Toxicants	
Total dissolved iron	0.0005 if Secchi > 1m NR <1m
Total arsenic	0.05 mg/L
Total cadmium	0.002 mg/L
Total chromium	0.05 mg/L
Total copper	0.005 mg/L
Total nickel	0.015 mg/L
Total lead	0.005 mg/L
Total zinc	0.05 mg/L
Oils and Grease	No visual films or grease
Polycyclic aromatic hydrocarbon (PAH)	0.003 mg/L
Total chlorine	0.02 mg/L

- Develop and implement measures to manage groundwater conditions based on the results of groundwater monitoring.
- Identify and implement design measures and construction methods to achieve maximum groundwater inflows 10 litres per second during construction and 5 litres per second (max) post-construction.
- Prepare and implement, prior to the commencement of construction, specific management plans for construction works that may disturb groundwater. These are to include, but not be limited to, measures to address the potential for, and prevent environmental impact from, groundwater drawdown.
- Identify through surveys and consultation, registered and unregistered water bores in the area potentially affected by groundwater drawdown and implement measures to manage potential effects on identified bores.
- Design and construct a dedicated groundwater control system, ensuring that potential seepage into underground works is captured and treated prior to release.
- Prior to construction, identify and implement management measures to ensure that accidental spills are cleaned-up and appropriately remediated to avoid contamination of groundwater seepage, as required.
- Store oils and fuels within impervious storage bunds (or double skinned tanks) to contain spillages or leaks.

Element 5 – Groundwater – construction	
Monitoring	**Water level drawdown monitoring** • Regularly monitor groundwater inflows to the tunnels, underground stations and excavations. • Monitor groundwater conditions near each worksite, underground works and excavations and assess deviations from seasonal baseline groundwater levels and identify/formulate appropriate mitigation options. **Contaminant migration monitoring** • Monitor groundwater within the tunnels, underground stations and shaft excavations to determine whether groundwater migration induced by the construction works is causing migration of contaminants or is draining from ASS. • Regularly monitor and maintain machinery and equipment to minimise the potential for oil leaks. Where oil leaks are identified, these are to be corrected immediately.
Reporting	• For groundwater quality and drawdown during construction – quarterly reporting of monitoring results. • Undertake an annual review of groundwater monitoring data to identify impacts and whether on-going monitoring is required • As required, report on corrective and preventative actions to DERM in relation to elevated physico-chemical and toxicant levels above BRWQ objectives and/or ANZECC criteria in the site water discharge.

Table 24-15 Element 6 – Surface water quality

Element 6 – Surface water quality – construction	
Environmental objectives	• Significant impacts on surface water quality are avoided. • Environmental values of receiving surface waters are maintained during and post construction.
Performance criteria	• Avoid release of sediments to surface waters occurs as a result of normal construction activities. • ASS is avoided, or if intercepted, ASS is managed to ensure no adverse impact on surface waters. • Contaminated soil disturbed by construction works is managed to avoid adverse impacts on surface waters. • Litter and toxicants are prevented from entering surface waters. • Surface water flows in streams adjacent to worksites and construction areas are maintained. • Wastewater discharges do not adversely affect the quality of receiving surface waters.

Mitigation measures	• Prior to the commencement of construction, develop and implement:
	• a soil, erosion and sediment control management plan
	• a water quality monitoring program to achieve Water Quality Objectives (WQOs) in accordance with:
	  • *Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2000*
	  • *Queensland Water Quality Guidelines 2009*
	  • *National Water Quality Management Strategy 2000.*
	• Water quality would be compared with the relevant WQO's. If concentrations exceed the trigger values, then additional investigation and mitigation measures would be implemented. WQOs are outlined in the Water Quality Objectives table.

Element 6 – Surface water quality – construction

Water Quality Objectives

Indicator	Mid-estuary, tidal canals, constructed estuaries	Upper estuary	Lowland freshwaters
pH	7.0-8.4	7.4-8.4	6.5-8.0
Dissolved oxygen	80-105 % saturation	80-105 % saturation	85-110 % saturation
Oxidised N	<10 µg/L	<15 µg/L	<60 µg/L
Organic N	<280 µg/L	<400 µg/L	<420 µg/L
Ammonia N	<10 µg/L	<30 µg/L	<20 µg/L
Total nitrogen	<300 µg/L	<450 µg/L	<500 µg/L
Total phosphorus	<25 µg/L	<30 µg/L	<50 µg/L
Filterable Reactive Phosphorus	<6 µg/L	<10 µg/L	<20 µg/L
Chlorophyll a	<4 µg/L	<8 µg/L	<5 µg/L
Turbidity (a)	<8 NTU	<25 NTU	<50 NTU
Turbidity (b)	<8 NTU	<25 NTU	<17 NTU
Secchi depth	>1 m	>0.5 m	n/a
Conductivity (a)	n/a	n/a	600 µS/cm
Conductivity (b)	n/a	n/a	1120 µS/cm*
Conductivity (c)	n/a	n/a	<770 µS/cm
Suspended solids	<20 mg/L	<25 mg/L	<6 mg/L
Aluminium pH >6.5 **	0.5 µg/L(1)	0.5 µg/L(1)	55 µg/L
Aluminium pH <6.5	0.5 µg/L(1)	0.5 µg/L(1)	0.8 µg/L(1)
Iron**	ID	ID	ID
Arsenic (AsIII)**	2.3 µg/L(2)	2.3 µg/L(2)	24 µg/L
Arsenic (AsV)**	4.5 µg/L(1)	4.5 µg/L(1)	13 µg/L
Cadmium**	0.7 µg/L(B)	0.7 µg/L(B)	0.2 µg/L
Chromium (CrIII)**	27.4 µg/L	27.4 µg/L	3.3 µg/L(1)
Chromium (CrVI)**	4.4 µg/L	4.4 µg/L	1 µg/L(C)
Copper**	1.3 µg/L	1.3 µg/L	1.4 µg/L
Lead**	4.4 µg/L	4.4 µg/L	3.4 µg/L
Nickel**	7 µg/L	7 µg/L	11 µg/L
Zinc**	15 µg/L(C)	15 µg/L(C)	8 µg/L(C)
Mercury (inorganic)**	0.1 µg/L	0.1 µg/L	0.06 µg/L
Chlorine**	3 µg/L(1)	3 µg/L(1)	3 µg/L
Polycyclic Aromatic Hydrocarbons (PAH)**			
Naphthalene	50 µg/L(C)	50 µg/L(C)	16 µg/L
Anthracene	0.4 µg/L(1)	0.4 µg/L(1)	0.4 µg/L(1)
Phenanthrene	2 µg/L(1)	2 µg/L(1)	2 µg/L(1)
Fluoranthene	1.4 µg/L(1)	1.4 µg/L(1)	1.4 µg/L(1)
Benzo(a)pyrene	0.2 µg/L(1)	0.2 µg/L(1)	0.2 µg/L(1)
BTEX**			
Benzene	500 µg/L(C)	500 µg/L(C)	950 µg/L
Toluene	180 µg/L(1)	180 µg/L(1)	180 µg/L(1)
Ethylbenzene	80 µg/L(1)	80 µg/L(1)	80 µg/L(1)
Ortho-xylene	ID	ID	350 µg/L
Meta-xylene	75 µg/L(1)	75 µg/L(1)	75 µg/L(1)
Para-xylene	ID	ID	200 µg/L

Notes:

Indicator values were sourced from the EPP (Water) 2009 Environmental Values and WQOs for the

Element 6 – Surface water quality – construction	
	Brisbane River (Basin No. 143) (DERM 2010b). Indicators marked with (**) were sourced from the ANZECC Water Quality Guidelines 2000. If a particular parameter is not given in the above table, reference should be made to the EPP (Water) 2009 and the ANZECC Water Quality Guidelines 2000. *n/a = not applicable for this indicator and water type.* *ID = insufficient data available to derive a reliable goal value.* *(B) = chemicals for which bioaccumulation and secondary poisoning effects should be considered.* *(C) = Figure may not protect key test species from chronic toxicity (ANZECC & ARMCANZ 2000, Section 3.4, Table 4.3.1).* *Turbidity (a) for Brisbane River and Oxley Creek and its tributaries, Turbidity (b) for Bundamba Creek.* *Conductivity (a) for Brisbane River, Conductivity (b) for Oxley Creek and its tributaries, Conductivity (c) for Bundamba Creek.* *Indicators marked with (*) were sourced from QWQG. To comply with these WQOs, the median value of the water quality data set should lie within the concentration range, or below the maximum concentration (DERM 2009b).* *(1) Low reliability trigger value for 95% protection, sourced from section 8.3.7 of the ANZECC 2000.* *(2) High reliability trigger value for 95% protection, sourced from section 8.3.7 of the ANZECC 2000.* • Design to achieve and implement erosion, sediment, dust, surface run-off and stormwater controls for the design rainfall event (ie 2 hour duration 2 year ARI event), including but not limited to, containment bunds, silt traps, sediment basins, fences, barriers, diversions, dust suppression, earth compaction, concrete washout pits, at construction worksites and work areas, particularly at those sites located near to Breakfast Creek, Moolabin Creek, Rocky Waterholes Creek and Stable Swamp Creek. • Prior to the commencement of construction, develop and implement storage and handling procedures for chemicals, litter and other hazardous materials, including procedures for preventing spills and rapidly and effectively responding to incidents and emergencies to avoid the release of contaminants to stormwater drains or surface waters. • Undertake washing, degreasing, servicing, cleaning and maintenance of vehicles, plant or other equipment away from areas where resulting contaminants may be released to any stormwater drain, land or waters. • Locate spoil placement sites away from creek banks and provide adequate bunding to prevent sediment run-off into waterways or stormwater drains or inundation in a one in five year flood event. • Incorporate into the final design, where possible, water sensitive urban design (WSUD) measures (eg swales, bio-retention systems, vegetation buffers) and water sensitive road design (WSRD) measures (eg treatment and pollution containment systems). • Incorporate measures into the ASS management plans to avoid or manage potential impacts on surface waters from surface and stormwater runoff. In particular, this includes, but is not limited to, measures for sites near Breakfast Creek and adjacent to Moolabin Creek. • Design culverts, bridges and embankments to avoid or minimise impacts on stream flows and water quality through scouring (eg placement of viaduct pilings across Moolabin Creek and bridge construction above Rocky Waterholes Creek). • Minimise wastewater generation during construction. Treat wastewater to a standard suitable for appropriate re-use or safe disposal in accordance with QWQG and ANZECC 2000 guidelines. • Develop and implement measures for the collection, treatment, diversion and assessment of wastewater generated from construction activities via an approved system (on-site or off-site), including the provision of temporary water treatment facilities at the Yeerongpilly, Boggo Road and Woolloongabba construction worksites. • Progressively restore and rehabilitate sites affected by construction works, particularly where new waterway crossings are built and where creek banks are impacted (eg Moolabin Creek, Rocky Waterholes Creek and Stable Swamp Creek).

Element 6 – Surface water quality – construction	

Monitoring	• Establish and implement a surface water quality monitoring program, prior to, during and subsequent to construction, to measure compliance with the water quality objectives outlined in:
	  • QWQG
	  • ANZECC 2000 guidelines.
	• Establish monitoring sites immediately upstream and downstream of construction worksites bordering waterways, such as Moolabin Creek and Breakfast Creek, as well as at other sensitive locations, including, but not be limited to, Stable Swamp Creek and Rocky Waterholes Creek near Clapham Rail Yard.
	• Monitor during rainfall events, and maintain as required, erosion, sediment, dust and stormwater control measures to ensure excess sediment, litter and other toxicants do not enter surface waters, particularly after rainfall events.

Reporting	• Monthly reporting on the surface water quality monitoring program to include validation of collected data and any non-compliances of discharge water with water quality objectives. • Immediate reporting of an incident, spill or other uncontrolled release of contaminants to the environment. • After a rainfall event exceeding a two year average recurrence interval.

Table 24-16 Element 7 – Flood management

Element 7 – Flood management – construction	
Environmental objective	• The effects of the Project on the existing flood regime of waterways during construction are minimal.
Performance criteria	• The Project works do not cause or contribute to afflux for a 1 in 5 AEP flood event or greater on the floodplain for any watercourse within the Study Corridor • The Project works do not cause flood waters to be re-directed over other private property • The Project works are protected from inundation by flood waters from a 1 in 5 AEP flood event.
Mitigation measures	• For construction worksites potentially affected by flooding (CBD – Albert Street, Yeerongpilly and Clapham Rail Yard) provide adequate bunding or level differences to protect against local flooding for a 1 in 5 AEP flood event. • Ensure site access from Lucy Street to the Yeerongpilly worksite is upgraded to enable all weather access for construction vehicles and equipment. For advisory purposes, Lucy Street should be raised at least to 10.5m AHD. • The spoil placement site at Swanbank to be managed to avoid inundation from a 1 in 5 AEP flood event or contained entirely within the form of existing mine voids. • Develop and implement safety measures for the construction works, including emergency measures to prevent flooding in tunnels during construction, and measures to prevent plant and equipment being inundated or submerged with flood waters. Such measures are to have a zero net effect on flood levels elsewhere on the floodplain.
Monitoring	• Monitor flooding events during construction. Issue warnings to construction site staff if flooding is considered likely.
Reporting	• Report on effects of a major flood event including damage to construction works, plant and equipment, loss of materials and contaminants and extent of rehabilitation and recovery works and actions for the affected works.

Table 24-17 Element 8 – Air quality

<table>
<tr><th colspan="2">Element 8 – Air Quality – Construction</th></tr>
<tr><td>Environmental objectives</td><td>• Nuisance is minimised at nearby sensitive receptors from dust and odour impacts on environmental values arising from construction activities
• Emissions of greenhouse gases are minimised during construction activities</td></tr>
<tr><td>Performance criteria</td><td>• Construction emissions are within the Construction air quality goals for total suspended particulates (TSP), particulate matter (PM) and deposited dust, as set out below: (construction air quality goals).
Construction air quality goals
<table>
<tr><th>Objective</th><th>Air Quality Indicator</th><th>Goals</th><th>Averaging Period</th><th>Allowable exceedances</th></tr>
<tr><td rowspan="2">Human health</td><td>Total suspended particulates</td><td>90 µg/m^3</td><td>1 year</td><td>none</td></tr>
<tr><td>Particulate matter (PM_{10})</td><td>50 µg/m^3</td><td>24 hours</td><td>5 exceedances per year</td></tr>
<tr><td rowspan="2">Nuisance</td><td>Total suspended particulates</td><td>80 µg/m^3</td><td>24 hours</td><td>none</td></tr>
<tr><td>Deposited dust</td><td>120 mg/m^2/day</td><td>30 days</td><td>none</td></tr>
</table></td></tr>
<tr><td>Mitigation measures</td><td>Air quality
• Prepare and implement a dust and odour management plan for the duration of construction activities.
• Establish baseline air quality data prior to construction, particularly around the five key construction worksites: Northern Portal (Victoria Park), Woolloongabba, Dutton Park (Boggo Road, Yeerongpilly and Clapham Rail Yard.
• At construction sites and spoil placement sites, monitor meteorological conditions, particularly wind speed and direction. When adverse meteorological conditions are experienced at worksites, such as windy conditions, take measures to avoid impacts of dust or odour on adjacent properties. Such measures may include:
  • modification of construction methods
  • increase in dust suppression measures
  • when no other reasonable or practical measure is available, cessation of work until the meteorological conditions improve and the environmental objective can be achieved.
• Ensure appropriate dust controls are used for demolition activities, including the use of water sprays and covering loads of material transported from the sites. Other measures may be initiated, particularly in respect of buildings containing hazardous or potentially hazardous materials.
• Manage the movement and handling, stockpiling and loading of construction spoil to avoid dust nuisance. The handling and loading of construction spoil for transport to the spoil placement site must be undertaken within enclosed work sheds., The movement of construction spoil from the tunnelling workface to the spoil loading facility must be within enclosed conveyances, whether on a conveyor or within a covered haul vehicle or some other enclosed equipment
• Where space allows, install truck wheel wash stations at locations in worksites. Where space constraints do not allow for the implementation of wheel wash stations, implement additional washing and sweeping of roads servicing worksite access and egress points to avoid the spillage of earth.
• Ensure adequate ventilation is installed and operated in underground construction works.
• Ventilation systems to include dust filtration capable of removing small particles with a mass of 10µg or a diameter of 10µm (ie PM_{10}). Emissions from the ventilation system are to be released from the ventilation system via high-level outlets standing at least 3m above the peak of the spoil enclosure. Dust collected from the filtration system must be disposed of appropriately.
• Ensure trucks transporting construction spoil are covered to prevent wind-blown dust during transport.
• Ensure loaded trucks are cleaned down prior to exit from the worksites and the spoil placement site.</td></tr>
</table>

<table>
<tr><th colspan="2">Element 8 – Air Quality – Construction</th></tr>
<tr><td></td><td>
Ensure regular sweeping and washing of sealed access roads to the worksite sheds.
Diesel exhaust emissions

Manage the movement of construction vehicles where entering or leaving construction sites to avoid queuing in residential streets approaching the worksites or adjacent to other sensitive activities.
Adopt procedures to avoid construction vehicles idling for excessive periods (eg more than five minutes) if required to queue to enter construction sites.
Ensure marshalling sites and queuing for trucks and site vehicles are located away from residential areas and other sensitive receivers.
Where feasible, collect and direct exhaust emissions from mobile and stationary plant away from sensitive receivers.
For stationary plant and equipment, ensure all diesel motors are fitted with emission control measures and that these are regularly maintained to manufacturers' specifications. Ensure also that engine emissions are collected and released to the atmosphere via high-level outlets standing at least 3m higher than the peak of the spoil handling shed or acoustic enclosure, whichever is the closer.

Odour

During the first disturbance of potentially odorous soils, implement reasonable and practicable measures to avoid or mitigate and manage impacts of odours on adjacent properties. Such measures may include:

identifying and determining the potential for odour impacts at off-site sensitive receptors
conducting works with odorous soils when wind directions are unlikely to affect sensitive receptors
covering odorous, excavated soil stockpiled either on a construction site or a spoil placement site to reduce odour impacts.

Greenhouse gases

Maintain construction plant and equipment and haul trucks in good working order to maximise the fuel efficiency of equipment.
Procure energy efficient construction equipment.
Use appropriately sized equipment for construction activities.
Minimise waste from construction.
Where feasible, use low energy intensity materials instead of high energy intensity building materials

</td></tr>
<tr><td>Monitoring</td><td>
Dust and odour
Undertake local, daily monitoring of ambient air quality against the air quality goals. Monitoring must be conducted in the vicinity of construction worksites in areas representative of the receiving environment and sensitive receptors for the duration of surface works, and in response to complaints. Monitoring locations are identified in the Worksite Monitoring Sites table.
Worksite Monitoring Sites
<table>
<tr><th>Worksite</th><th>Monitoring sites</th></tr>
<tr><td>Northern portal</td><td>Victoria Park, adjacent to BGGS
Gregory Terrace, adjacent to Centenary Aquatic Centre</td></tr>
<tr><td>Roma Street</td><td>Adjacent to apartment complex, Roma Street Parkland</td></tr>
<tr><td>Albert Street</td><td>Albert Street, western side opposite southern shaft, at 3rd floor level
Albert Street, western side opposite northern shaft, at street level</td></tr>
<tr><td>Woolloongabba</td><td>TMR / EPA monitoring station (existing)
Reid Street, adjacent to Chalk Hotel car parking</td></tr>
<tr><td>Boggo Road</td><td>Dutton Park State School, adjacent boundary to worksite
Maldon Street adjacent to Multiple Sclerosis headquarters
Rawnsley Street, at selected residence</td></tr>
<tr><td>Ventilation and emergency access building (Fairfield)</td><td>Fairfield Road, western side north of Venner Road, at selected residence
Railway Parade, north of Bledisloe Street, at selected residence</td></tr>
</table>
</td></tr>
</table>

Element 8 – Air Quality – Construction		
	Yeerongpilly	Crichton Street, east of realignment of Wilkie Street, at selected residence Olive Street, at selected residence Bow Street – Park Lane residential area, at selected residence Allawah Street, near Palomar Road, at selected residence
	Swanbank spoil site	If required, off Cummer Road

	• Undertake visual inspections for dust generating activities on a daily basis (eg stockpiles, vehicles and roads leaving construction sites for evidence of dust generation or loose, unstable material with potential for dust).
	• Monitor meteorological conditions daily, or more frequently if required by adverse conditions including strong winds and winds prevailing upon sensitive activities. Monitoring would be required each hour for the duration of adverse conditions.
	• Undertake olfactory inspections for potential odour generating activities on a daily basis. At each location, observations would be made on odour intensity, persistence and character.
	Vehicle emissions
	• Monitor construction vehicle movements to:
	  • prevent queuing in streets, other than designated haul routes identified in the construction traffic management plan
	  • prevent queuing vehicles idling for periods exceeding five minutes.
	• Collect and direct exhaust emissions from stationary plant and equipment away from sensitive activities and neighbouring properties.	

Reporting	• Monthly reports on the findings of the air quality monitoring program and results of odour monitoring carried out by site personnel. • Maintain records of the number of incidents or complaints received in relation to dust or odour impacts. • Record actions taken to mitigate incidents or complaints.	

Table 24-18 Element 9 – Noise and Vibration

Element 9 – Noise and Vibration – Construction	

Environmental objectives	• The acoustic environment is protected for human comfort, normal daily life and urban amenity, from the adverse effects of construction activities, to:
	  • maintain human health and well-being, in particular to minimise sleep disturbance.
	  • maintain the continued existing use of premises.
	• Registered heritage buildings, sensitive sites and other structures are protected from the effects of vibration from construction activities.
	• Potentially affected and concerned property owners and occupants within, and adjoining, the construction works corridor are consulted about construction effects on the acoustic environment.

Performance criteria	• Construction activities satisfy the requirements of a construction noise and vibration management plan prepared and approved prior to the commencement of construction works, including demolition and site establishment works.
	• Noise goals (internal) are achieved during the construction phase, unless:
	  • identified by predictive modelling conducted prior to the commencement of works in the locality, and only then
	  • if effective mitigation measures to mitigate the exceedances of the noise goals are developed and agreed in consultation with potentially affected people, and such measures are implemented prior to the commencement of the works.
	• Noise goals (internal) for construction works are summarised in Goals for Construction Noise table.

Element 9 – Noise and Vibration – Construction

Goals for internal noise - construction

	Monday – Saturday 6.30 am – 6.30 pm	Monday – Saturday 6.30 pm – 10 pm	Monday – Saturday 10 pm – 6.30 am Sundays, Public Holidays	Monday – Saturday 7.00 am – 6.00 pm
Continuous ($L_{A\ eq\ adj}$)(1hr)	AS 2107 Maximum design level	AS 2107 Maximum design level	AS 1055.2 (App A) R1 – R3: 35dBA R4 - R6: 40dBA	**Blasting (airblast)** 130dB linear peak
Intermittent ($L_{A10\ adj}$)(1hr) ($L_{A\ Max}$)	AS 2107 Maximum design level + 10dBA	AS 2107 Maximum design level +10dBA	AS 1055.2 (App A) R1 – R3: 45dBA R4 - R6: 50dBA	

Implementation Notes:

1 All goals are internal noise levels

2 Where internal noise levels are unable to be measured or monitored, the typical noise reductions presented in *Guideline Planning for Noise Control*, Ecoaccess, DERM, July 2004 apply.

3 Construction noise between 6.30 pm and 10 pm Monday to Saturday would be permitted only in those locations identified for surface works during those hours (refer to Table 24-10: General – construction, Hours of work.

- Vibration goals are achieved during the construction phase, unless:
  - identified by predictive modelling conducted prior to the commencement of works in the locality, and only then
  - if effective mitigation measures to nullify the exceedances of the vibration goals are developed and agreed in consultation with potentially affected people, and such measures are implemented prior to the commencement of the works.
- Construction vibration goals at the nearest sensitive properties are summarised in the Goals for Construction Vibration table.
- Where guide values are provided in respect of sensitive building contents, predictive modelling must take into account the manufacturer's specifications for tolerance to vibration and adopt such specifications as goals for construction to avoid or minimise impacts on the normal operation of such equipment.

Goals for construction vibration

Receiver	Cosmetic Damage		Human Comfort		Sensitive Building Contents
	Continuous (mm/sec PPV)	Transient (mm/sec PPV)	Day (mm/sec PPV)	Night (mm/sec PPV)	Guide values
Residential	5	25 (>35Hz) 10 (<35Hz)	AS 2670 applies	0.5	-
Heritage place	2	2	-	-	-
Sensitive equipment A	-	-	-	-	0.5 – 2.0
Sensitive equipment B	-	-	-	-	1.0 – 5.0
Sensitive equipment A		Includes precision balances, some optical microscopes – check specifications.			
Sensitive equipment B		Includes large computer disk drives, sensitive electronic equipment – check specifications.			

Element 9 – Noise and Vibration – Construction	

Mitigation measures	**General – Noise**
	• Prior to the commencement of construction in a locality, including demolition works, undertake predictive modelling to identify the likely acoustic impacts.
	• Where the works in a locality are predicted to exceed the goals nominated in this draft Outline EMP (Construction), the Proponent (or its agent or contracted entity) is to :
	  • re-examine the proposed construction methods to identify and implement possible reductions in noise from construction
	  • initiate on-going and early consultations with potentially affected owners and occupants of premises predicted to be affected by exceedances of the goals for construction noise, to determine suitable mitigation measures
	  • implement mitigation measures that would achieve the environmental objectives, which would either avoid or minimise exceedances of the goals. This is to be done in consultation with potentially affected owners and occupants.
	• Generally, construction is to be planned and undertaken with the following measures:
	  • use the quietest plant and equipment reasonably expected to be available to undertake each component of the work.
	  • regular maintenance of equipment to ensure that all plant and equipment remains in good working order and does not create noise nuisance incrementally.
	  • minimise the coincidence of noisy plant and equipment working simultaneously near sensitive receptors.
	  • install temporary tunnel ventilation plant likely to serve as a noise source down in the construction shaft, with appropriate ducting to the surface, and install acoustic louvres at enclosure ventilation points.
	  • fit residential class mufflers to mobile plant and equipment, such as but not limited to excavators, front end loader and other diesel powered equipment, where engaged in works in or adjacent to residential areas.
	  • ensure careful placement within each worksite of fixed plant (eg compressors) to maximise shielding or separation from sensitive receptors.
	  • minimise the use of warning devices (eg reversing alarms) on plant and equipment working adjacent sensitive receptors to within operational health and safety constraints.
	  • use temporary noise screens or barriers for particularly noisy operations such as pile boring, rock breaking, and blasting. Such screens or barriers are to be of appropriate design and specifications to achieve the environmental objectives at the nearest sensitive receptors.
	General – Vibration
	• Prior to the commencement of construction in a locality, undertake predictive modelling of construction vibration likely from both surface and underground construction works. The predictive modelling is to identify the impacts from ground-borne vibration.
	• Where the works in a locality are predicted to exceed the goals nominated in this draft Outline EMP (Construction), the Proponent is to:
	• review alternative construction methods aimed at reducing the extent of potential impacts
	  • conduct surveys in the locality to identify places or clusters of places especially sensitive to sleep disturbance (eg hospitals, nursing homes and child care centres)
	  • conduct surveys in the locality to identify and determine the specifications for building equipment known to be sensitive to vibration, such as computers, microscopes, surgical equipment
	  • conduct pre- and post-construction building condition surveys where potential cosmetic (superficial) building damage could occur as a consequence of the construction works
	  • consult with owners and occupants of premises predicted to be affected by vibration associated with the construction works to develop acceptable measures to mitigate the impacts on people and property

Element 9 – Noise and Vibration – Construction	
	• consult with the local community early and in an on-going process about the nature, intensity and duration of the works in each locality • ensure local communities are kept continuously informed about forthcoming noise and vibration activities, their durations, monitoring regimes and mitigation measures. • Mitigation measures for construction vibration at affected receptors are to achieve the environmental objectives and may include one or more of the following: • changes in construction methods or programming, to avoid periods in which the predicted exceedance would impact on the most people • provide property treatments for properties predicted to be directly affected with exceedances of the goals. Such treatments are to be agreed with the property owner in consultation with the occupants • changes or refinements in Project design if reasonable and practicable, having regard for the overall purpose and intention of the Project and the flow-on effects of such changes or refinements • provision of temporary emergency accommodation as a last resort if no other viable solution is available to mitigate the predicted or actual impacts of construction. **Construction worksites: noise and vibration** • Northern Portal (Victoria Park): • Prior to the commencement of works, including demolition works and site preparation works, install acoustic barriers or screens, so that the barriers protect local communities to the south of Gregory Terrace and the Centenary Aquatic Centre. • Undertake early and on-going consultation with residents of Gregory Terrace and the Centenary Aquatic Centre to identify and avoid or minimise potential impacts. • Ekka Station: • Prior to the commencement of works, including demolition works and site preparation works, install acoustic barriers or screens around the worksite, so that the barriers protect local communities to the north of O'Connell Terrace. • Undertake early and on-going consultations with residents and owners and occupants of businesses north of O'Connell Terrace (eg Tufton Street), the owners and operators of Clem Jones Tunnel, and the RNA to identify and avoid or minimise potential noise and vibration impacts. • Conduct pre-construction building surveys and monitoring should vibration-intensive construction works occur within 10 m of RNA Showground heritage structures. • Roma Street Station and associated underground works: • For surface works between 6:30pm-10:00pm Monday to Friday, mitigation measures are to be implemented prior to the commencement of work between these hours. • Prior to the commencement of works, including demolition works and site preparation works, install acoustic barriers or screens around the worksites to protect local communities in Roma Street Parkland and to the west of Roma Street. Such barriers or screens are to include an acoustic shed over each shaft if night-time works are proposed underground. • Consult in advance with owners and occupants of properties adjacent to the station works and the tunnel corridor under Roma Street Parkland and Spring Hill of the programme of works, including advance notice of activities likely to approach or exceed the noise or vibration goals. • Undertake monitoring of ground-borne vibration and noise at both the old Roma Street Station building and at residential premises in the Roma Street Parkland. • Albert Street Station and associated underground works: • For surface works between 6:30pm-10:00pm Monday to Friday, mitigation measures are to be implemented prior to the commencement of work between these hours. • Prior to the commencement of works, including demolition works and site preparation works, install acoustic barriers or screens around the worksites to protect nearby sensitive receptors. Such barriers or screens are to include an acoustic shed over each shaft if night-time surface works are proposed.

Element 9 – Noise and Vibration – Construction	
	• Undertake initial site establishment and piling activities during the day-time (6:30 am to 6:30 pm) period only. • consult in advance with owners and occupants of properties adjacent to the station works and the tunnel corridor along Albert Street to Roma Street about the programme of works, including advance notice of activities likely to approach or exceed the noise or vibration goals. • Undertake monitoring or ground-borne vibration and noise at several places representative of the sensitive receptors along Albert Street, including at least the City Hall, residential premises and commercial premises containing sensitive office equipment • Gabba Station: • For surface works between 6:30pm-10:00pm Monday to Friday, the goals for noise and vibration emissions are to be applied and achieved as if they were upper limits, with no exceedances permitted. Adequate mitigation measures are to be implemented prior to the commencement of work between these hours. • Prior to the commencement of works, including demolition works and site preparation works, install acoustic screens or barriers to protect local communities north of Vulture Street and to the south of Stanley Street. • Undertake initial site establishment and piling activities during the 6:30 am to 6:30 pm period only. • An acoustic shed or acoustic enclosure is to be provided over or around the station box within the worksite upon completion of piling activities. The shed is to be equipped with acoustic-screened doors at the entry and exit points for spoil haulage vehicles. • Provide an acoustic shed or acoustic enclosure over or around the spoil handling and loading operations. Spoil haulage vehicles are to be loaded within the shed or enclosure at all times and the doors are to be closed for spoil loading and other above-ground works between the hours of 6.30 pm and 6.30 am. • Undertake monitoring of construction noise at residential premises immediately to the north of Vulture Street. • Boggo Road Station: • Conduct site establishment and initial excavation activities during the daytime period only. • Prior to the commencement of works, including demolition works and site preparation works, install an acoustic barrier or enclosure around the worksite to protect the nearest sensitive communities in Rawnsley Street and the Leukemia Support Village. • Programme the construction works to ensure the shortest time practicable between commencement of excavation works and installation of the ‘cut-and-cover lid’ over the station box, or, install an acoustic enclosure or acoustic shed over the excavation immediately upon completion of piling works. • Prior to the commencement of works, including site preparation and demolition, consult with operators of the Ecoscience building to minimise the effects of construction on sensitive equipment (eg Transmission Electron Microscope). • Conduct vibration monitoring during construction works to ensure potential impacts on TEM operations, on the heritage-listed Boggo Road Gaol and on the heritage listed South Brisbane Cemetery are avoided, or managed to achieve the guide values. • Conduct monitoring of construction noise during construction works at the Ecoscience building (internal atrium), at residential premises in Rawnsley Street, and at the Dutton Park State School. • Ventilation and emergency access shaft (Fairfield): • Prior to the commencement of works, such as piling and shaft excavation, install acoustic barriers or screens to protect the local community, and in particular, the residential premises to the east of Fairfield Road. • If night works are proposed, implement mitigation measures to achieve the environmental objectives prior to the commencement of night works.

Element 9 – Noise and Vibration – Construction	
	• Conduct monitoring of construction noise during construction works at residential premises in Railway Road. • Southern portal including realignment of Wilkie Street: • Prior to the commencement of works, including site preparation works other than the realignment of Wilkie Street, install acoustic barriers or screens to protect the local community, and in particular, the residential premises to the east of the railway and the new alignment of Wilkie Street. • Works required for the realignment of Wilkie Street must be conducted during standard daylight hours (ie 6:30am to 6:30pm, Monday to Saturday, with no work on Sundays or public holidays). An effective acoustic barrier to achieve the environmental objectives for construction noise and rail corridor noise (operation) must be installed on the western side of the realigned Wilkie Street as soon as practicable after completion of the Wilkie Street works. The barrier must be designed and constructed to achieve the Queensland Rail noise goals for all sensitive receptors east of Wilkie Street. • Prior to the commencement of underground works, including tunnelling, involving the generation of spoil, establish an acoustic enclosure, to transport the spoil from the work-face to the main worksite on Station Road. The acoustic enclosure is to be designed and situated within the worksite to provide effective mitigation for noise generated by the movement of construction materials and spoil to and from the work-face. • Plan and programme the construction works to minimise and mitigate the effects of piling, excavation works, installation of the 'cut-and-cover lid' over the tunnel portals, and assembly and launching of the TBMs. • Install an acoustic enclosure or acoustic shed to screen sensitive receptors to the east and west of the portal area around or over the TBM assembly and launch site as soon as practicable. • Consult with the Yeerongpilly residential community and St Fabien's Church and advise of the programme of works, including the anticipated duration of surface works. • Conduct monitoring of construction noise during construction works at residential premises to the east of Wilkie Street. • Yeerongpilly Station and Yeerongpilly worksite: • Prior to the commencement of works, including demolition works and site preparation works, establish an acoustic barrier to protect nearby residents and businesses, in particular the residential community east of Wilkie Street and north of Station Road and Lucy Street. The acoustic barrier may include the retention of existing buildings as a 'front line' to nearby sensitive receptors. • Provide an acoustic barrier along Lucy Street between the worksite and the industrial buildings to the east (ie over or across Moolabin Creek) to screen the Yeerongpilly residential community from noise generated by spoil haulage vehicles and materials delivery vehicles. • Provide an acoustic enclosure or acoustic shed over the spoil receiving, handling and loading operations. Spoil haulage vehicles are to be loaded within the shed or enclosure at all times and the doors are to be closed for spoil loading and other above-ground works between the hours of 6.30 pm and 6.30 am. • Conduct monitoring of construction noise during construction works at residential premises to the south of Livingstone Street and to the south of Park Lane, Yeerongpilly. • Clapham Rail Yard: • Undertake campaign monitoring of construction noise, in particular earthmoving equipment, during the establishment of Clapham Rail Yard. Such monitoring is to be conducted in the early phases of the works and focus on residential premises to the south-west (Melbourne Street, Rocklea) and to the east (Blackburn Street, Moorooka).

Element 9 – Noise and Vibration – Construction	

	• Rocklea Station:
	  • Prior to the commencement of works, including any demolition works and site preparation works, install an acoustic barrier or enclosure along the southern boundary of the worksite to protect the nearest sensitive communities in Brooke Street.
	• Surface road works – O'Connell Terrace and Ipswich Motorway on-ramp:
	  • For surface works between 6:30 pm – 10:00 pm Monday to Friday, mitigation measures are to be implemented prior to the commencement of work between these hours.
	  • Where out-of-hours work is required to minimise disruption to the operation and function of essential transport infrastructure at either O'Connell Terrace or at the Ipswich Motorway, advance consultation with potentially affected owners and occupants of nearby properties are to be undertaken to devise mitigation measures for potential noise and vibration impacts.
	• Mechanical tunnel construction:
	  • Prior to commencement and then progressively, undertake predictive modelling, supplemented by 'actual' monitoring data to refine model to identify potential exceedances of the goals for construction noise and vibration.
	  • Where such predictive modelling indicates the goals would be exceeded, undertake advance consultation with the potentially affected owners and occupants of premises, to devise mitigation measures and to inform them of the construction programme and the likely duration of the predicted exceedance.
	  • Generally, undertake advance consultation in localities, ahead of tunnelling activities. Consultation is to include information on the rate of progress, the potential effects and the monitoring program which may require involvement from residents located above the main tunnel alignments.
	  • In localities where predictive modelling indicates a risk of exceedances of the goals for construction vibration, conduct building condition surveys before and following completion of tunnel construction.
	  • Conduct monitoring of ground-borne noise and vibration along the main tunnel alignments and in proximity to the underground stations to inform and refine predictive modelling and the development of mitigation measures, and to provide feedback to the community and regulatory agencies on performance in relation to the goals for construction noise and vibration.
	• Low frequency construction noise:
	  • Implement a comprehensive notification and education program to assist in allaying community concerns in localities where low frequency noise would likely be exceeded during tunnelling works.
	  • Provide local communities with tunnelling progress and subsequent likely (temporary) exposure periods.
	  • Construction traffic noise and vibration:
	  • Restrict heavy goods vehicle movements to operating only on designated haulage routes for construction materials and spoil.
	• Blasting:
	  • Where drilling and blasting is required mitigation would include the following:
	  • utilising the latest available blasting technology
	  • pre-blasting condition surveys of adjacent buildings
	  • early consultation with local communities and pre-warnings of the timing of the blast activities
	  • limit blasting between 7am to 6 pm Monday to Saturday, desirably to regular scheduled times in localities where repeated blasting is required by construction or ground conditions.

Element 9 – Noise and Vibration – Construction	

Monitoring	• Implement a comprehensive program of noise and vibration monitoring where construction works would be close (ie less than 100 m) to residences or other sensitive receptors.
	• Monitor a representative sensitive receptor in locations where predictive modelling indicates exceedences of either the noise or vibration goals could occur.
	• Undertake campaign (ie site specific) monitoring in response to complaints about construction noise or vibration
	• Undertake monitoring of construction noise and vibration in accordance with accredited procedures.
	• Report monitoring results and management actions.
	• Undertake building pre-condition surveys for historical buildings and other structures in vibration sensitive zones (where required), including but not limited to:
	  • RNA Showground - heritage structures
	  • Roma Street Station
	  • Queensland University of Technology (QUT) building
	  • former Boggo Road Gaol
	  • St Nicholas Cathedral
	  • St Josephs Church & School
	  • Grosvenor Hall Child Care Centre

Reporting	• Monthly reporting of the noise and vibration monitoring program. • Monthly reporting on performance and complaints.

Table 24-19 Element 10 – Nature conservation

Element 10 – Nature conservation – construction	
Environmental objectives	• Ecological, habitat and natural asset values of Victoria Park, the Botanic Gardens, and other open space areas near the Project, are maintained. • No net loss of habitat or native vegetation occurs as a result of the design or construction of the Project. • Construction activities do not cause the introduction or spread of pest species.
Performance criteria	• No loss of mature vegetation communities occurs due to groundwater drawdown • No loss of mature vegetation outside of the clearing footprint due to construction activities. • Habitat for native flora removed during construction is restored and vegetation communities rehabilitated to the extent reasonable and practicable. • A Species Management Programme is developed and approved by DERM in respect of any animal breeding places disturbed by construction works. • Necessary clearing permits or approvals for vegetation clearing are obtained, and clearing is undertaken in accordance with these permits or approvals. • Pest species declared under the *Land Protection (Pest and Stock Route Management) Regulation 2003* are not spread or introduced during construction. • Rehabilitation and landscape plans comply with the *Electrical Safety Act 2002* and Queensland Rail maintenance policies and where practicable, use endemic plants.

Mitigation measures	• Minimise disturbance to vegetation communities and habitat during construction, including clearly marking and mapping vegetation to be retained.
	• Where reasonable and practicable, locate construction site infrastructure, such as site offices, vehicle access and parking, material storage and cleaning areas for plant and equipment away from large trees and their drip zones, particularly:
	  • in Victoria Park
	  • in relation to the figs located along Alice Street within the City Botanic Gardens.
	• Minimise disturbance to and the loss of mature figs and other native trees in Victoria Park outside and within the worksite for the northern portal. Upon completion of the works, rehabilitate the worksite and include plantings of semi-mature fig trees.
	• Prior to tunnel construction, engage an aborist to assess significant landscape trees that

Element 10 – Nature conservation – construction	

	may be potentially affected by tunnelling works, and where required, prepare and implement a management plan for trees potentially at risk of being affected. This is to include, but not be limited to, the fig trees located along Alice Street near to the proposed Albert Street Station and Alice Street underground concourse.
	• Implement site management procedures to avoid or minimise potential for harming native fauna and respond to incidents when fauna enter construction worksites. Such procedures may include:
	  • fencing of construction worksite boundaries to separate fauna from construction works
	  • harvesting hollow bearing trees cleared for Project works and retro-fitting to form nest boxes
	  • education and training of construction workers about native fauna being protected and procedures to avoid harming fauna
	  • use of a qualified and registered fauna spotter/ catcher prior to and during the initial vegetation clearing to capture and relocate disturbed fauna.
	• Prior to clearing vegetation, relocate, repair or replace where necessary, the existing fauna boxes situated in the northern section of Victoria Park.
	• Prepare and implement a Pest Management Plan, which includes measures consistent with Queensland Rail procedures. This is to be prepared prior to the commencement of any site works or construction.
	• Prepare and implement landscape and rehabilitation plans, which consider the requirements of the *Electrical Safety Act 2002* and Queensland Rail maintenance policies and which use native endemic plants, where appropriate. This is to include investigation of opportunities for improvements to habitat as a result of the Project works, particularly in relation to the worksite adjacent to Moolabin Creek and Breakfast/Enoggera Creek.
	• Where safety considerations allow, lighting for night-time activities should not disperse outside the target area and should not include the use of mercury lamps, which attract insects and other fauna to construction areas. This is particularly important for works in close proximity to Breakfast/Enoggera Creek and Victoria Park.
	Red Imported Fire Ants
	• Prior to the commencement of any site works or construction, prepare and implement for each construction worksite or work area, a specific Approved Risk Management Plan for Red Imported Fire Ants.
	• Comply with DEEDI (Bio-security Queensland) requirements for all construction worksites and the spoil placement site at Swanbank, in relation to the management requirements for the movement of restricted materials.

Monitoring	• Undertake regular inspections of work areas to ensure that vegetation marked for retention is not damaged or removed. • Regularly inspect construction worksites and other work areas, as appropriate, to assess compliance with mitigation measures identified to minimise impacts on flora and fauna. • Inspect and monitor construction worksites and other work areas monthly, as appropriate, for pests (flora and fauna). • Inspect and monitor construction worksites and the spoil placement sites monthly for the presence of fire ants. • Monitor significant trees identified as being at potential risk from the Project during construction and for two growing seasons after completion of construction works.
Reporting	• Monthly during site preparation, construction and rehabilitation.

Table 24-20 Element 11 –Cultural heritage

Element 11 – Cultural heritage – construction	
Environmental objectives	• Cultural heritage values for Indigenous heritage sites or places are maintained. • Cultural heritage values for significant cultural heritage sites, places or structures are maintained.
Performance criteria	• Approved Aboriginal Cultural Heritage Management Plan(s) (CHMPs) prepared in consultation with both the Jagera people and the Turrbal people, and pursuant to the requirements of the *Aboriginal Cultural Heritage* Act 2003, prior to commencement of construction. • Compliance with Cultural Heritage Duty of Care to Aboriginal cultural heritage. • Relevant assessment processes and associated conditions are obtained prior to construction affecting registered areas of cultural heritage significance. • Construction impacts, such as excessive dust deposition, excessive vibration or excessive settlement, do not affect places of non-Indigenous cultural heritage significance.

Mitigation measures	**Indigenous cultural heritage**
	• Prepare and agree a CHMP to guide the management of construction activities to minimise impacts on culturally important sites or artefacts. This is to include , but not be limited to, measures relating to:
	  • Aboriginal Parties monitoring surface earthworks or vegetation clearing in the vicinity of places of Indigenous cultural heritage significance, and particularly at York's Hollow.
	  • Aboriginal Parties monitoring ground breaking activities that may impact on their cultural heritage values.
	  • Aboriginal Parties monitoring construction works at Moolabin Creek and at other waterways as agreed.
	  • Aboriginal Parties to deliver the Aboriginal component of the cultural awareness training.
	• Arrangements for the storage of any Aboriginal artefacts collected by the Aboriginal Parties during the monitoring activities or by Project staff during construction.
	• Any artefacts found during the course of construction are to be preserved. Artefacts found within an area of overlapping native title claim are to be kept in a neutral keeping place pending the outcome of the Native Title determination in relation to that area of overlap. Artefacts found in the non-overlap area are to be retained by the relevant Traditional Owner Party.
	• Construction work is to be undertaken in accordance with the approved CHMP for the locality.
	• Explore opportunities for acknowledgment of a locality's significance to Aboriginal people (eg establishment of signage or public art or through involvement of Indigenous people in any ground-breaking ceremonies that might precede construction works).
	Non-Indigenous cultural heritage
	• Consistent with any conditions imposed on the Project by the Queensland Heritage Council, prepare a CHMP in respect of places of non-Indigenous cultural heritage significance to guide and manage construction and to ensure the values attributed to such places are maintained. Preparation of each CHMP is to be informed by predictive modelling of criteria relevant to each place (eg vibration, settlement, groundwater drawdown) and is to include mitigation measures to achieve the environmental objectives in relation to the heritage values for each place.
	• Prepare a site specific CHMP for each place of State significance directly affected, based on the condition surveys, including:
	  • RNA Showgrounds
	  • Victoria Park
	  • Roma Street Station
	  • Boggo Road Gaol Division 1 and 2
	  • Rocklea Station
	  • Salisbury Station.

Element 11 – Cultural heritage – construction	
	• Conduct condition surveys on each building of State Heritage significance along the main tunnel alignment and adjacent to the underground stations prior to the commencement of construction works in the locality to determine the potential susceptibility to settlement and other construction impacts. • Where harm to non-Indigenous heritage values cannot be reasonably or practically avoided, undertake archival recording of cultural heritage values with the advice of an appropriately qualified heritage consultant.

Monitoring	• Monitoring of compliance with the measures outlined in each CHMP:
	  • For heritage places identified in a CHMP as being at risk of damage during construction, daily during performance of the construction works, with monitoring to identify the scope and extent of the potential damage in relation to the mitigation measures.
	  • For places of Indigenous cultural heritage significance, monitor as provided in the relevant CHMP.

Reporting	• On completion of surface work, or, in case of intercepting archaeological relics or artefacts of heritage significance, as provided by the CHMP. • On completion of construction for each site, or as provided by the CHMP.

Table 24-21 Element 12 – Visual amenity and lighting

Element 12 – Visual amenity and lighting – construction	
Environmental objectives	• Deliver positive outcomes for the local community through the application of high quality urban and landscape design measures. • Minimise and mitigate impacts on the visual and landscape environment. • Avoid light nuisance for sensitive receptors and maintain safe driving conditions for motorists, near to construction works.
Performance criteria	• Design features of new infrastructure avoid or minimise the visual and landscape impacts on areas near to Project works through integration with existing built and landscape elements, and in the scale and character of the built form. • Impacts of construction works on existing visual amenity are minimised through the design and siting of screens and barriers, plant and equipment, buildings and other structures, and lighting and telecom towers. • Project lighting is designed, constructed and operated to comply with AS4282-1997; Control of the obtrusive effects of outdoor lighting. • Nuisance from construction lighting on sensitive receptors and onto nearby roads, pedestrian and cycle paths, and parklands is avoided.

Mitigation measures	• Provide a reasonable and practicable off-set for any loss of public open space, significant and mature trees or landscape values taken for the Project, through the replanting of worksites and other public spaces in proximity to worksites and Project infrastructure.
	• Incorporate landscaping, urban design and public art treatments into Project works adjacent to public roads and thoroughfares, and visually prominent sections of the rail corridor to minimise the visual impacts of Project infrastructure. At a minimum, these measures are required for:
	  • stations, station entrances, plazas and ventilation plant and outlets
	  • streetscape improvements and pedestrian links
	  • new noise barriers
	  • the Fairfield ventilation and emergency access building
	  • surface feeder stations
	  • viaduct at Mayne Rail Yard and Clapham Rail Yard (Moorooka).
	• Ensure urban design treatments are consistent with, and respect, the character and amenity of the surrounding area.
	• Design noise barriers to reduce the visual impacts from surrounding properties and roadways by:
	  • incorporating high quality materials, urban design treatments and landscape elements

Element 12 – Visual amenity and lighting – construction	
	such as low, massed plantings • using, where appropriate, clear or transparent materials to maintain existing expansive views beyond the rail corridor • avoiding the use of highly reflective materials and materials that support graffiti. • Restore, rehabilitate, and where appropriate enhance, open space and public areas disturbed or damaged by construction works as soon as practicable following construction, including: • Victoria Park • Alice Street and the City Botanic Gardens • the environs of the Fairfield ventilation and emergency access building. • Provide noise barriers and hoardings around construction worksites to mitigate the views of construction works. Where appropriate, these are to incorporate landscaping and urban design measures to minimise the visual impact of the barriers, and are to be regularly maintained. • Maintain or enhance passive surveillance to Wilkie Street through the use of appropriately designed property fencing and streetscape works. • At construction worksites and near other Project works, use directionally-controlled, shielded lights that are mounted at a sufficient height to allow the light to be appropriately targeted, to minimise light spill to surrounding properties, maintain safe driving conditions for motorists on adjacent roads and minimise impacts on local fauna. • Implement light barriers between Project works and adjacent road corridors.
Monitoring	• Weekly inspections of temporary visual barriers and hoardings for graffiti or damage. • Regular inspections of lighting to ensure that it is not causing nuisance at surrounding properties or unsafe driving conditions.
Reporting	• Immediate reporting of any complaint about light nuisance or damage to barriers and hoardings.

Table 24-22 Element 13 – Community engagement

Element 13 – Community engagement – construction	
Environmental objectives	• Ensure communities likely to be directed affected by the Project works are aware of the Project works in advance of their commencement, and are aware of the procedures for making complaints about the Project works.
Performance criteria	• Communities are notified in advance of construction activities, including timing and duration, likely impacts and proposed mitigation measures. • Communities have access to an effective and responsive communication and complaints process to address and respond to community issues. • Impacts on local amenity and community life are avoided, minimised, mitigated or managed.
Mitigation measures	**Community consultation and engagement** • Prepare and implement a Stakeholder and Community Engagement Strategy, prior to the commencement of construction activities, which outlines the community consultation procedures for the construction phase of the Project. • Undertake and maintain a comprehensive and accessible community information program to inform local and regional communities of Project activities and potential impacts. This includes, but is not limited to: • residents, businesses, community groups, community facilities near construction works and along the tunnel alignment • communities within suburbs closest to the study corridor • rail passengers, public transport users and road users, including motorists, pedestrians and cyclists. • Establish procedures and mechanisms through which the community can obtain information, discuss and provide feedback on the Project, construction activities and environmental management measures. This includes, but is not limited to, regular

Element 13 – Community engagement – construction	

	distribution of newsletters, regular advertisements in local newspapers, information sessions, face-to-face meetings, community consultative committees, and community feedback mechanisms such as phone or email.
	• Initiate consultation with owners and occupants of directly-affected properties and nearest neighbours to construction activities, as soon as practicable after a decision to proceed with the Project is taken.
	• Undertake early and on-going notification with affected property owners, tenants and local and broader communities, in advance of construction activities, about construction activities, including timing and duration, likely impacts and proposed mitigation or management measures.
	• Establish at least two community consultative committees, including one for communities south of the Brisbane River and one for communities north of the Brisbane River, Among other things, the community consultative committees are to:
	  • comprise representatives of neighbourhoods nearest to construction works, including residents, businesses, community facilities and groups
	  • be facilitated by an independent person
	  • involve regular meetings during construction, to provide information on the progress of construction works and outcomes of monitoring, and allow committee members to provide feedback on construction activities, environmental management measures, and other matters relevant to the Project's construction.
	Complaints management
	• Develop and implement, prior to the commencement of construction activities, a process for receiving, handling and responding in a timely and effective manner, to complaints and community enquiries received about construction. This process include, but not be limited to:
	  • establishment and maintenance of a 24 hour, seven day a week, toll-free telephone line
	  • procedures and mechanisms to raise community awareness of the complaints process, such as through the Project newsletters, website, advertisements and other notices
	  • a process for recording and tracking complaints and responses.
	Amenity and community life
	• Liaise with key stakeholders and the community through the community consultative committees to identify community needs with regards pedestrian and cycle connections:
	  • with existing pedestrian and cycle networks
	  • within Victoria Park
	  • to community facilities, such as schools, shopping centres, and open space areas
	  • to public transport facilities, including Salisbury, Rocklea, Moorooka and Yeerongpilly stations, Park Road Station and Boggo Road Busway Station, Woolloongabba Busway Station, Roma Street Station and Bowen Hills Station.
	Social Infrastructure
	• Undertake early and on-going consultation with managers of community facilities in neighbourhoods adjacent to worksites and other construction works or above the main alignment, to provide updates on construction activities, identify likely impacts, and develop effective mitigation strategies. Community facilities for which managers are to be consulted include, but are not limited to:
	  • RNA Showgrounds, Bowen Hills
	  • Centenary Pool, Spring Hill
	  • Emma Miller Place, Brisbane City
	  • Botanic Gardens, Brisbane City
	  • Russian Orthodox Cathedral of St Nicolas, Woolloongabba
	  • Dutton Park Primary School, Dutton Park
	  • Sunshine Welfare & Remedial Association, Dutton Park

Element 13 – Community engagement – construction	
	• Iglesia Evangelica Pentecostal Church, Fairfield • Grosvenor Hall Preschool and Early Learning Centre, Yeronga • Yeronga Park C & K Kindergarten and Preschool, Yeronga • Yeronga State School, Yeronga • St Fabians Church Yeronga, Yeronga • the Endeavour Foundation and Centacare (currently located within the proposed worksite in Yeerongpilly). • Undertake early and on-going consultation with the Leukaemia Foundation about potential impacts on their planned accommodation facility at Boggo Road Urban Village.
Monitoring	• On-going, community complaints and responses.
Reporting	• Provide reporting on complaints received, responses provided, timeliness of responses, and corrective actions taken on a monthly basis. • As soon as possible in case of a safety incident or complaint from a neighbour to a worksite.

Table 24-23 Element 14 – Economics

Element 14 – Economics – construction	
Environmental objective	• Avoid, or minimise and mitigate impacts on local businesses.
Performance criteria	• Access for customers and delivery vehicles is maintained to local businesses near to construction works. • Businesses located near to construction works are notified in advance of construction activities, including timing and duration, likely impacts and proposed mitigation measures.
Mitigation measures	• Maintain safe and efficient access for pedestrians and vehicles, including delivery vehicles, to businesses near to the construction worksites and other construction works, including providing alterative access, where required. • Undertake early and on-going notification with business owners near to construction worksites or other construction works, in advance of construction activities, about construction activities, including timing and duration, likely impacts and proposed mitigation or management measures. In particular, this is to should include, but not be limited to, businesses in: • Albert Street, Brisbane City • Ipswich Road, Moorooka • Annie Street, Fairfield Road, Railway Parade, Lillian Avenue and Dollis Street at Rocklea • Unwin and Eversham streets, Salisbury. • Undertake on-going consultation with the RNA to ensure suitable access is maintained to the RNA Showgrounds for livestock and delivery vehicles during the Ekka and other major scheduled events at the RNA Showgrounds. General road access is also to be maintained to the RNA Showgrounds during the course of the Project works. • Undertake consultation with Weston Milling at Fairfield Road, Yeerongpilly, during detailed design, about access arrangements to land adjoining Weston Milling that is not required for the Project. • Engage with relevant economic development stakeholders, including but not limited to, officers from the DEEDI to identify the range of assistance services available to assist businesses impacted directly by Project works. • Develop and distribute information packages to affected businesses, that provides information on available assistance packages.
Monitoring	• Monitor consultation with and feedback from local business owners.
Reporting	• Nil

Table 24-24 Element 15 – Waste management

Element 15 – Waste management – construction	
Environmental objectives	• All forms of waste from construction activities, including demolition, are minimised. • Impacts to the environment and surrounding communities due to the handling and disposal of waste are minimised. • Construction materials are recycled and re-used, where practicable.

Performance Criteria	• Construction activities are conducted in accordance with a Project Waste and Resource Recovery Management Plan (WRRMP) including:
	  • waste management principles (avoid, reduce, reuse and recycle) and sustainable disposal strategies are implemented
	  • targets to recover and re-use construction waste, including demolition waste for all classes or categories of waste
	  • all reasonable and practicable steps are taken to minimise the impacts of handling and disposal of construction waste at the worksites, and at the disposal sites.
	• Hazardous waste is handled and disposed of in accordance with specific management plans approved by Workplace Health and Safety Queensland (Hazardous Industries and Chemicals Branch)

Mitigation measures	**Avoid and reduce**
	• Identify and implement measures for avoiding waste generation and, if avoidance is not reasonable or practicable, reducing on-site waste generation.
	• Where reasonable and practicable, order goods in bulk to minimise packaging waste, and where practicable, return packaging materials to the supplier.
	• Develop and implement arrangements with suppliers to return unused construction materials to the supplier.
	• Encourage Project workers to avoid or reduce waste, wherever possible.
	Re-use
	• Identify and implement strategies for the re-use of waste products generated during construction.
	• Where reasonable and practicable, chip and mulch vegetation cleared for the Project and re-use mulched material for landscaping purposes.
	• Where reasonable and practicable, provide for the re-use of:
	  • excavated material as fill at approved fill sites
	  • concrete formwork throughout the Project
	  • reinforced steel structures in the Project
	  • structures, including culverts, cabling, poles and similar infrastructure.
	Recycle
	• Develop and implement Project specific recycling strategies.
	• Consider using materials and products that have a recycled content wherever cost/performance competitive, and where environmentally preferable to the non-recycled alternative.
	• Where reasonable and practicable, transfer kerb and pavement materials (concrete, asphalt) to crushing and recycling plants.
	• Provide recycling bins, skips and storage areas for general rubbish and recyclable materials.
	• Investigate the availability of treated wastewater, stormwater run-off or groundwater in-flow for site activities, such as dust mitigation, wash-down uses or watering landscape works.
	• Where reasonable and practicable, segregate metals for recycling.
	• Collect empty oil and fuel drums and other containers for return to licensed recycling facilities. This is to be done by a licensed contractor.
	• Ensure that sufficient loading/ unloading space is provided at construction worksites to allow waste materials to be sorted for recycling and reuse.

Element 15 – Waste management – construction	

	• Waste and resource recovery
	• Prepare and implement a WRRMP prior to the commencement of construction, which outlines:
	  • waste management procedures for construction, including demolition, and the handling and disposal of asbestos materials
	  • incident management procedures for responding to incidents that have the potential to cause environmental harm, including:
	  • corrective or remedial actions as required to render the area safe and avoid or minimise environmental harm
	  • procedures for immediately reporting to relevant authorities any incident where harmful waste material is released to the environment
	  • pre-qualification requirements for contractors providing services in waste and recyclables receiving facilities
	  • relevant training and awareness strategies for employees on waste management procedures and principles, including recycling opportunities
	  • arrangements for decommissioning construction work sites post-construction.
	Waste transport
	• Ensure the movement of hazardous materials and regulated wastes occurs at non-peak times to minimise the possibility of traffic conflicts and associated risks.
	• Ensure that waste transport contractors have obtained the necessary qualifications and permits prior to undertaking waste transportation activities for the Project.
	• Conduct waste tracking in accordance with legislative requirements.
	Hazardous materials or dangerous goods
	• Prepare and implement a Hazardous Goods Management Plan in consultation with Workplace Health and Safety Queensland (HCIB).
	• Undertake the storage and transport of any hazardous materials or dangerous goods in accordance with relevant Australian standards, legislative requirements and guidelines.
	• Undertake refuelling and maintenance activities within designated bunded areas to minimise the potential for soil and water contamination from these activities.
	• Prepare and implement, if required, spill response measures in relation to hazardous materials and dangerous goods.
	• Comply with the ENA Industry guideline for SF6 Management.
	Contaminated soil
	• Manage and dispose of contaminated soil in accordance with the procedures outlined in EP Act.
	On-site waste storage
	• Maintain accessible and stable areas at construction worksites for the storage of waste materials.
	• Monitor for the presence of vermin, insects and pest levels and implement appropriate control measures, as required.
	Demolition works
	• Where reasonable and practicable, implement demolition procedures that facilitate recovery of materials for re-use and segregation of different types of materials for recycling.
	• Collect appropriate demolition materials and where possible, re-use on site, or transport to a recycling depot or facility.
	• Where reasonable and practicable, provide salvaging contractors the opportunity to salvage building materials prior to demolition so that applicable items can be re-used.
	• Where possible, engage a salvaging contractor to remove houses identified for demolition for re-use.

Monitoring	• Monitoring of waste management associated with and in accordance with specific management plan requirements, including: • resource use and waste generated from demolition and construction works

Element 15 – Waste management – construction	
	• waste recovered and re-used • waste disposed to landfill.
Reporting	• Reports on monitoring outcomes in relation to management plans are to be prepared monthly. • Report immediately to the relevant authorities any incident where harmful waste material is accidentally released to the environment. • Quarterly reports on resource use to be compiled (particularly for that associated with water use, electricity use and diesel/fuel use).

Table 24-25 Element 16 – Climate change and sustainability

Element 16 – Climate change and sustainability – construction	
Environmental objectives	• Ensure, through design that the Project is adaptable to conditions that may arise as a result of climate change. • Ensure that the Project design minimises energy demand and lifecycle energy consumption.
Performance criteria	• The Project design accommodates the predicted 2100 sea level rise. • The Project design achieves specific energy efficiency and resource efficiency measures. • Material use is minimised and the reuse and recycle of materials is maximised. • The use of potable water supply and energy in construction is minimised.
Mitigation measures	• Design the Project infrastructure to achieve immunity for a predicted 0.8 m sea level rise scenario in 2100. • Investigate during the detailed design phase, the potential for additional energy efficiency measures to be incorporated into the design and construction of the Project. • Identify opportunities to incorporate water efficiency and energy efficiency measures into the Project design. • Identify and implement measures to maximise the use of grey water or capture, store and use stormwater or seepage groundwater for construction activities. • Investigate opportunities to maximise the re-use of spoil on the Project or for other projects, subject to requirements of the Commonwealth Government with regards the referral made pursuant to the *Environment Protection and Biodiversity Conservation Act 1992*. • Implement measures to avoid and reduce, re-use and recycle materials use across construction activities. • Develop a sustainable procurement strategy. • Undertake a greenhouse gas (GHG) emissions inventory in line with the GHG protocol for all phases of the Project. • Develop and implement a local procurement policy for goods and services. • Create a Sustainability Tool during Detailed Design to track initiatives and requirements.
Monitoring	• Monitor that measures are incorporated into the Detailed Design and that measures are followed through to construction and operation. • Regular monitoring (weekly) of the worksites for compliance with Waste Management Plan developed during Detailed Design for the Project. • Monitor energy consumption and potable water use monthly. • Monitor the implementation of adopted sustainability requirements.
Reporting	• Half-yearly sustainability reporting for all relevant aspects and monitoring results for compliance with this draft Outline EMP. • Energy consumption and potable water use to be reported on monthly. • Maintain the Sustainability Tool for the Project, by auditing and reporting on the sustainability design requirements that have been incorporated into the final design.

Table 24-26 Element 17 – Hazard and risk

Element 17 – Hazard and risk – construction	
Environmental objective	• Hazardous events as a result of construction activities are avoided, or managed to minimise risk if they occur.
Performance criteria	• A safe working environment is maintained for the construction workforce, near neighbours and passers-by, including pedestrians, cyclists and motorists. • All reasonable and practicable measures are taken to minimise potential construction hazard and risks for rail workers, rail operators, rail passengers, the community and the environment. • The Project hazard and risk register is maintained as a current and accurate central record of Project hazards and risk reduction/mitigation strategies that are adopted throughout construction.

Mitigation measures	• Prior to the commencement of construction works, develop and implement a Construction Hazard and Risk Plan that considers the potential risks associated with construction including, but not limited to, risk minimisation and incident management, inundation, flood inundation of the underground works, tunnel collapse, fire and chemical hazard and traffic hazards associated with construction traffic.
	• Establish procedures for communication with Queensland Rail about construction activities in or near to the rail corridor and potential hazards and risks.
	• Prior to the commencement of construction, prepare emergency response and incident management procedures, and implement in the event of accidents and emergencies. These are to be prepared in consultation with the Department of Community Safety and relevant emergency services organisations. Among other things, these are to outline:
	  • responsibilities in the event of an incident.
	  • traffic management and control systems.
	  • evacuation routes in the event of an incident.
	  • education and training program for the construction workforce on the procedures.
	  • procedures for conducting simulated emergency response exercise. This is to be conducted at least once within 12 months of the commencement of construction works.
	• Ensure that access to construction worksites and other work areas is provided and maintained at all times for emergency services vehicles.
	• Establish a communication process with the Department of Community Safety and relevant emergency services providers in relation to temporary road closures and disruptions and relocation of water mains that would affect hydrants near construction works.
	• Provide fire and life safety measures, including ventilation, smoke extraction and fire fighting systems for enclosed spaces and enclosed work areas such as underground works areas, acoustic enclosures and sheds, for the duration of construction.
	• Develop a construction methodology that complies with Queensland Rail standards for track isolation and protection of Queensland Rail infrastructure.
	• Develop and implement an inspection and maintenance schedule for plant and equipment used at construction worksites.
	• Implement, review and maintain a hazard and risk register as the current and central record of Project hazards and risk reduction/mitigation strategies that will be adopted throughout construction.
	• Implement risk mitigation strategies for the hazards identified for each Project aspect in the hazard and risk register.

Monitoring	• Undertake monthly on-site safety inspections in conjunction with personnel from the Department of Community Safety. • Regular hazard and risk assessments as part of routine construction site management procedures.
Reporting	• Monthly, unless in the case of an incident when reporting is to occur immediately on completion of the incident investigation.

24.10 Draft Outline EMP (Operations)

This section describes the environmental objectives and performance criteria for each environmental element relevant to the Project's operations. Mitigation measures to achieve the environmental objectives and performance criteria are also recommended. Specific monitoring requirements and statutory requirements are also identified for some environmental elements.

The environmental elements relevant to the draft Outline EMP (Operations) are:

- Transport and access
- Climate change and sustainability
- Land contamination
- Groundwater
- Surface water quality
- Nature conservation
- Air quality
- Noise and vibration
- Visual amenity and lighting
- Waste management
- Hazard and risk.

The elements for the draft Outline OEMP are outlined in the following tables.

Table 24-27 Element 1 – Transport and access

Element 1 – Transport and access – operations	
Environmental objectives	• Access for emergency services is maintained to the Cross River Rail tunnel systems and Cross River Rail stations. • Impacts of commuter traffic and parking are avoided or minimised for neighbourhoods near Project stations. • Safe and efficient access for pedestrians and cyclists is maintained in the vicinity of stations.
Performance criteria	• The Project is operated in accordance with Queensland Rail procedures. • An emergency response and management plan is agreed by the Project operators and the emergency services authorities prior to the commencement of operations • Pedestrian and cyclist access during peak periods, major events and emergency incidents is safe and efficient • Safety Management Systems are prepared by the rail transport operator as per the requirements of the *Transport (Rail Safety) Act 2010*.
Mitigation measures	• Consult regularly and frequently with emergency services providers about emergency access arrangements to the tunnel systems and stations in preparing and implementing an emergency response and management plan. • Ensure emergency service access is maintained to the tunnel systems and stations. • Develop and implement, in consultation with Brisbane City Council, local parking management plans, which may include resident parking schemes for local streets in the vicinity of Cross River Rail stations. • Develop and implement, in consultation with Brisbane City Council and other relevant stakeholders, measures to manage pedestrian and cyclist access to stations during peak periods, major events and emergency incidents, in the vicinity of stations and on high volume pedestrian routes serving the stations. • Install, maintain and operate closed circuit television (CCTV) surveillance of pedestrian walkways approaching the Ekka Station, Albert Street Station, Boggo Road Station and Yeerongpilly Station. Extend the coverage of existing CCTV surveillance at Roma Street Station to the pedestrian walkways accessing the underground stations. • Establish and maintain appropriate signage in the vicinity of Cross River Rail stations to assist pedestrians accessing the stations. • Develop and implement a community education and awareness strategy about the commencement of Cross River Rail operations and how its operations might affect local movements during major events and emergencies.

Element 1 – Transport and access – operations	

Monitoring	• In the first year of operations:
	  • periodically monitor pedestrian crowding on footpaths in the vicinity of the Albert Street and Roma Street stations during the morning and evening weekday peak periods, and during major events at Suncorp Stadium.
	  • monitor pedestrian crowding on the footpaths and pedestrian link between the Gabba Station and The Gabba Stadium, during major events (ie cricket and football).
	• Continuously:
	  • monitor effective implementation of major events and emergency management plans
	  • monitor effective implementation of car parking demand in the vicinity of Yeerongpilly Station
	  • monitor effective management of pedestrian movement and crowding within the stations and on the platforms
	  • monitor pedestrian safety in the vicinity of Cross River Rail stations, particularly during the night.

Reporting	• As required by Queensland Rail procedures.

Table 24-28 Element 2 – Climate change and sustainability

Element 2 – Climate change and sustainability – operations	
Environmental objectives	• Energy demand and consumption by the Project is minimised. • Use of potable water by the Project is minimised. • GHG emissions from the operation of the Project are minimised.
Performance criteria	• Train services are scheduled to optimise patronage and to integrate with other modes of public transport to provide an attractive alternative to private motor vehicle usage • Underground stations are ventilated to reduce energy consumption and to maintain a steady flow of fresh air to all pedestrian and working areas. • Use of potable water for train and station wash-down and other cleaning is minimised to the extent reasonable and practicable.
Mitigation measures	• Undertake an energy audit during the first year of operation and develop and implement an energy efficiency plan. • Regularly maintain energy consuming plant and equipment to ensure optimal performance. • Maximise the use of greywater and stormwater or groundwater collected from the Project, including in the maintenance of landscaping. • Undertake a GHG emissions inventory in accordance with the GHG protocol. • Prepare and implement an accredited carbon management plan. • Align the Project with Queensland Rail's existing requirements under the Energy *Efficiency Opportunities Act 2006* and the *National Greenhouse and Energy Reporting Act 2007*.
Monitoring	• Monthly reporting on resource use. • Sustainability manager to ensure that sustainability requirements are followed through to the operation phase of the Project.
Reporting	• Report on climate change and sustainability outcomes within a quarterly performance report.

Table 24-29 Element 3 – Groundwater

Element 3 – Groundwater – operations	
Environmental objectives	• Groundwater quality is maintained at pre-construction levels. • Changes to groundwater levels surrounding the Project are minimised.
Performance criteria	• Contamination of groundwater is avoided. • Groundwater inflow to underground elements of the Project does not exceed 10L/sec..
Mitigation measures	• Implement Queensland Rail Standard ENV/STD/2015/SYS: Environmental Management System in relation to the storage and handling of fuels and chemicals and the management of spills and leaks • Contaminated groundwater entering the rail tunnels and underground stations is treated and managed in accordance with Queensland Rail Standard ENV/STD/2015/SYS: Environmental Management System. • Spills and leaks of fuels or chemicals are managed in accordance with Queensland Rail's Standard ENV/STD/2015/SYS: Environmental Management System.
Monitoring	• Groundwater inflows to the rail tunnels and underground stations are monitored to identify significant changes in quality. If a significant change occurs, potential risks are identified and rectified as appropriate. • Regularly monitor groundwater levels with respect to drawdown and quality. • Assess deviations from seasonal baseline groundwater levels and identify/ formulate appropriate mitigation options.
Reporting	• As required by Queensland Rail Standard ENV/STD/2015/SYS: Environmental Management System.

Table 24-30 Element 4 – Surface water quality

Element 4 – Surface water quality – operations	
Environmental objective	• Impacts on surface water quality are avoided.
Performance criteria	• Environmental values of surface waters are maintained. • No release of sediment or other water-borne contaminants to surface waters occurs as a result of runoff or discharges/ spills from operating procedures.
Mitigation measures	• A surface water quality management plan (operations) is prepared and implemented in consultation with DERM prior to commencement of the Project operations. • Implement Queensland Rail Standard ENV/STD/2015/SYS: Environmental Management System in relation to the storage and handling of fuels and chemicals and the management of spills and leaks • Measures are implemented in accordance with Queensland Rail Standard ENV/STD/2015/SYS: Environmental Management System for managing impacts on surface water quality. • Measures are implemented to contain and prevent fire retardants and other chemicals entering a watercourse in the event of an emergency or incident arising from operation of the Project.
Monitoring	• Immediately after an emergency event of incident involving the use of fire retardants or similar chemicals, or where a spill involving either chemicals or fuels has occurred – in the nearest receiving waters, and then periodically thereafter to identify on-going impacts. • Otherwise, as required by Queensland Rail Standard ENV/STD/2015/SYS: Environmental Management System.
Reporting	• As required by Queensland Rail Standard ENV/STD/2015/SYS: Environmental Management System.

Table 24-31 Element 5 – Nature conservation

Element 5 – Nature conservation – operations	
Environmental objective	• Damage to significant trees and plants located above the rail tunnels or near to the underground stations is avoided.
Performance criteria	• None of the significant trees and plants in Victoria Park, the Roma Street Parkland, the City Botanic Gardens adjacent to the Project in Alice Street are lost as a consequence of Project effects (ie groundwater drawdown, disturbance of root system, soil compaction, soil contamination, or physical interference).
Mitigation measures	• Identify significant trees to be conserved and maintained and, acting on the advice of an appropriately qualified person, identify any specific growing behaviours or requirements. • In consultation with the Brisbane City Council and the Queensland Herbarium, develop and implement specific plans to manage the immediate environs for significant trees to conserve and maintain each plant.
Monitoring	• Monitor regularly the health of significant trees and plants in Victoria Park, the Roma Street Parkland, and the Botanic Gardens adjacent to the Project in Alice Street that may be potentially affected by Project effects for two growing seasons after the completion of construction works at each place. • Monitoring would be conducted at least monthly for the first two years.
Reporting	• Provide a brief report on plant health each quarter for inclusion in the quarterly environmental report for the first two years. • Provide a report immediately on detection of signs of plant distress.

Table 24-32 Element 6 – Air quality

Element 6 – Air quality – operations	
Environmental objectives	• No risk to public health due to in tunnel and underground station air quality. • No change to air temperatures at sensitive receptors and at ground level adjacent to Project ventilation outlets
Performance criteria	• Air quality in the tunnels and underground stations is maintained to avoid risk to public health and to achieve the air quality objectives of EPP(Air). • Air temperatures at a sensitive receptor adjacent to a ventilation outlet do not vary by more than 0.5ºC from ambient temperatures if they were to be measured at any place within 100m of the sensitive receptor.
Mitigation measures	• Ventilation systems for the stations and tunnels are regularly maintained to ensure good air quality is maintained within the tunnels and underground stations. • Soil gas accumulation in the tunnels is managed at safe levels for human health and the environment.
Monitoring	• Monitoring generally is to be conducted in accordance with the Air Quality Sampling Manual, QEPA, Queensland Government, 1997 • Conduct ongoing monitoring of gas levels, including oxygen, methane, carbon dioxide and carbon monoxide, in underground structures using gas monitoring systems and alarms fitted in subsurface infrastructure. • Otherwise, as required by Queensland Rail Standard ENV/STD/2015/SYS: Environmental Management System.
Reporting	• As required by Queensland Rail Standard ENV/STD/2015/SYS: Environmental Management System.

Table 24-33 Element 7 – Noise and vibration

<table>
<tr><th colspan="2">Element 7 – Noise and vibration – operations</th></tr>
<tr><td>Environmental objective</td><td>• Maintain a reasonable acoustic environment, including human comfort, normal daily life and urban amenity, during Project operations.</td></tr>
<tr><td>Performance criteria</td><td>
• The Project achieves the relevant noise criteria for railway surface track airborne noise emissions as outlined in Queensland Rail's Code of Practice – Railway Noise Management, being at present:
  • 65 dBA, evaluated as the 24 hour average equivalent continuous A-weighted sound pressure level
  • 87 dBA, evaluated as a Single Event Maximum sound pressure level.

Ground-borne noise goals

The Project operates generally within the goals for ground-borne noise outlined in the Ground-borne noise goals (rail operations) table.

Ground-borne noise goals (rail operations)
<table>
<tr><th>Receiver</th><th>Time of Day</th><th>Noise Trigger Level (dBA)</th></tr>
<tr><td rowspan="2">Residential</td><td>Day (7.00 am to 10.00 pm)</td><td>40 dBA</td></tr>
<tr><td>Night (10.00 pm to 7.00 am)</td><td>35 dBA</td></tr>
<tr><td>Schools, educational institutions, places of worship.</td><td>When in use</td><td>40 dBA to 45 dBA</td></tr>
<tr><td>Retail areas</td><td>When in use</td><td>50 dBA to 55 dBA</td></tr>
<tr><td>General office areas</td><td>When in use</td><td>45 dBA</td></tr>
<tr><td>Private offices and conference rooms</td><td>When in use</td><td>40 dBA</td></tr>
<tr><td>Theatres</td><td>When in use</td><td>35 dBA</td></tr>
</table>

The Project operates generally within the goals for ground-borne vibration outlined Ground-borne vibration goals (rail operations) table.

Ground-borne vibration goals (rail operations)
<table>
<tr><th>Receiver type</th><th>Period</th><th>Vibration goal (vibration velocity)</th></tr>
<tr><td>Residential</td><td>Day/Night</td><td>106 dB_V (0.2 mm/s)</td></tr>
<tr><td>Commercial and community facilities (including schools and places of worship)</td><td>When in use</td><td>112 dB_V (0.4 mm/s)</td></tr>
<tr><td>Industrial</td><td>When in use</td><td>118 dB_V (0.8 mm/s)</td></tr>
<tr><td>Sensitive equipment within medical or research facilities</td><td>When in use</td><td>82 dB_V (0.013 mm/s)</td></tr>
</table>

Surface mechanical plant and ventilation

Surface mechanical plant and ventilation systems operate within the noise goals outlined Mechanical plant noise goals (operations) table.

Mechanical plant noise goals (operations)
<table>
<tr><th>Receiver</th><th>Time of Day</th><th>Background (b/g) noise creep dBA LA90 (1hour)</th><th>Acoustic quality objectives dBA LAeq (1hour)</th></tr>
<tr><td rowspan="2">Residential (for outdoors).</td><td>7.00 am to 10.00 pm</td><td>b/g + 0</td><td>50</td></tr>
<tr><td>10.00 pm to 7.00 am</td><td>b/g + 0</td><td>-</td></tr>
<tr><td rowspan="2">Residential (for indoors).</td><td>7.00 am to 10.00 pm</td><td>-</td><td>35</td></tr>
<tr><td>10.00 pm to 7.00 am</td><td>-</td><td>30</td></tr>
</table>
</td></tr>
</table>

Element 7 – Noise and vibration – operations				
	Library and educational institution (including a school, college and university) (for indoors).	when open for business or when classes are being offered	-	35
	Commercial and retail activity (for indoors).	when the activity is open for business	-	45
Mitigation measures	• Adequate noise barriers are installed to ensure compliance with the operational noise goals and to achieve the environmental objective for noise and vibration. • For stabling operations at Clapham Rail Yard, a possible alternative mitigation measure to noise barriers would involve the stabling of trains on the outer (eastern) tracks in the first instance to provide a buffer for stabling on inner tracks. • Maintain tracks and track fastenings to minimise ground borne noise.			
Monitoring	• Monitor in response to complaints in accordance with Queensland Rail's Code of Practice for Railway Noise Management.			
Reporting	• As required by Queensland Rail Standard ENV/STD/2015/SYS: Environmental Management System and Standard EMS/STD/46/004: Code of Practice – Railway Noise Management.			

Table 24-34 Element 8 – Visual Amenity and lighting

Element 8 – Visual amenity and lighting – operations	
Environmental objective	• Landscaping and urban design treatments, including noise barriers, are maintained to achieve a reasonable visual amenity and passenger safety.
Performance criteria	• Landscaping and urban design treatments are maintained to achieve design specifications. • Noise barriers are maintained in accordance with Queensland Rail policies. • Lighting is installed and maintained in accordance with AS4282 -1997 'Control of the Obtrusive Effects of Outdoor Lighting' and Queensland Rail procedures and policies.
Mitigation measures	• Landscaping provided for the Project to be monitored periodically and maintained during the establishment phase for the first 12 months of operation. • Beyond the first 12 months of operation, landscaping to be maintained in accordance with Queensland Rail's PS-CS-MAN-0013 Station Design Guide. • Noise barriers and urban design elements to be maintained in accordance with Queensland Rail's procedures. • Lighting required for the Project is to be installed and maintained in accordance with the AS4282 -1997 'Control of the Obtrusive Effects of Outdoor Lighting' and Queensland Rail policies and procedures.
Monitoring	• As required by Queensland Rail procedures. • Monthly, or in response to complaints
Reporting	• As required by Queensland Rail procedures.

Table 24-35 Element 9 – Waste management

Element 9 – Waste management – operations	
Environmental objectives	• Waste generation is minimised and the reuse and recycling of waste items and materials is maximised. • No risk to human health or the environment occurs from the transport, storage, handling or disposal of waste.
Performance criteria	• Waste minimisation strategies are implemented in accordance with Queensland Rail procedures. • Waste is collected, transported, stored, handled and disposed in accordance with Queensland Rail policies and procedures.

Element 9 – Waste management – operations	
Mitigation measures	• Implement measures to manage waste generated by the Project in accordance with Queensland Rail practices and procedures.
Monitoring	• Monitor resource usage and waste generated in accordance with Queensland Rail practices.
Reporting	• As required by Queensland Rail procedures.

Table 24-36 Element 10 – Hazard and risk

Element 10 – Hazard and risk – operations	
Environmental objective	• Potential hazards do not present risks to people and the environment.
Performance criteria	• Potential hazards are identified and managed to avoid risk for people and the environment. • An operations hazard and risk management plan is developed and implemented. • A safe environment is maintained for Project users and staff • In the event the Project is declared a Security-Identified Surface Transport Operation transit security is managed in accordance with the requirements set out in the Surface Transport Security Plan.

Mitigation measures	• An operations hazard and risk management plan is developed and implemented in consultation with the Department of Community Safety, the emergency services agencies and DERM. The management plan is to address:
	  • matters raised by the stakeholders during consultation
	  • a robust communications and management system to manage the safe and effective operation of the tunnels and stations
	  • emergency response and incident management procedures
	  • training requirements for Project workers and emergency agencies
	  • passenger information and safety systems at stations such as public address and emergency call point facilities.
	• Maintain well-lit site lines within stations and station plazas to maximise safety for Project users and staff.
	• Establish an inspection and maintenance schedule for all plant, equipment and infrastructure.
	• Prepare and implement a Surface Transport Security Plan to provide a systematic and consistent approach to counter terrorism,

Monitoring	• Monitor and control the safe and effective operation of the tunnels, stations, pedestrian walkways and customer car parking.
Reporting	• As required by Queensland Rail procedures.