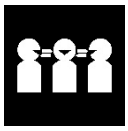
Cross River Rail Project:

Coordinator-General's change report

June 2017

Queensland Government

The Department of State Development



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Synopsis

The original Cross River Rail Project (the project) comprised an 18 kilometre (km) link from Salisbury to Bowen Hills, Brisbane including 10 km of tunnel from Yeerongpilly under the Brisbane River and Central Business District (CBD). On 20 December 2012, the Coordinator-General approved the project subject to conditions and released his evaluation report (CGER) on the environmental impact statement (EIS) for the project.

On 5 December 2016, the proponent, the State of Queensland represented by the Department of Transport and Main Roads (TMR), lodged an application for project changes with the Coordinator-General.

The proposed changes to the project include:

- reduction of the proposed total length of the project, from 18 km to 10.2 km, including some alterations to the underground alignment of the tunnel
- reduction in the proposed extent of underground tunnelling from 10 km to 5.9 km
- changes to the southern and northern portal locations
- minor changes to the location of the proposed Albert Street, Boggo Road, Woolloongabba, Roma Street and Exhibition Railway Stations
- pedestrianisation of sections of Albert Street between Charlotte Street and Elizabeth Street
- changes to tunnel construction methods for some sections, from bored to mined
- reduction in the number of surface properties requiring acquisition from 108 to 29, with no residential properties now proposed for acquisition
- demolition of the Brisbane Transit Centre (BTC) (West) building due to the realignment of the Roma Street Railway Station
- change in the number of spoil placement locations from one (Swanbank) to five potential sites (Brisbane Airport, Swanbank, Pine Mountain, Larapinta and Port of Brisbane)

During the public consultation period, 177 submissions were received on the application for project change—27 from public organisations, 130 from private submitters and 20 from state and local advisory agencies.

The following is a summary of the main issues arising from my evaluation of the project changes.

Land

Compared to the project, the changed project generally reduces potential impacts on land use, tenure, land contamination, topography, geography and soils. To further reduce potential impacts from the changed project on topography, geology and soils, I have required the proponent to prepare an erosion and sediment control management plan to be submitted as part of the Outline Environmental Management Plan (OEMP) for my approval. To ensure certainty of geological conditions prior to construction, the proponent will gather further information to confirm these conditions prior to

construction and I require an outline of the proposed geotechnical survey program to be included within the OEMP.

The total number of surface and volumetric acquisitions has been reduced from 412 to 224 properties and construction works would be predominantly contained with the existing rail corridor.

Noise and vibration

The potential noise and vibration impacts of the changed project are generally consistent with the impacts of the project except in the vicinity of the new southern portal adjacent to the proposed Boggo Road Railway Station.

In order to manage the potential noise and vibration impacts of the changed project, I have imposed conditions outlining the approach to noise and vibration management measures for the proponent to implement during both construction and operations.

Traffic and Transport

The potential traffic and transport impacts of the changed project are generally consistent with the impacts of the project with the exception of spoil haulage, and traffic and pedestrian access in Albert Street. The changed project will result in an overall reduction in potential impacts on traffic, pedestrian and cycle movements compared to the project due to the shortened tunnel length and a reduction in the overall amount of spoil proposed to be removed. Consistent with the project, the changed project will enhance access to key public transport infrastructure within and surrounding the Brisbane CBD.

In order to manage the potential impacts of construction workforce traffic and parking and spoil haulage movements, I have imposed conditions requiring the proponent to develop the mitigation measures through an OEMP which will be submitted for my approval prior to the commencement of construction.

Air quality

The potential air quality impacts of the changed project are generally consistent with the impacts of the project. In consideration of the unique sensitivities at the southern portal/Boggo Road Railway Station worksite, I have recommended that the proponent undertake predictive air quality modelling for this area, and where impacts are predicted to exceed the goals in my imposed conditions, the proponent consult with directly affected persons in the development of mitigation measures.
I have also required the proponent to develop and implement an air quality management plan. I expect this plan to include relevant methodologies to support the establishment of adaptive management strategies, including predictive dust modelling and air quality modelling for all construction worksites.

Social environment

The potential social impacts of the changed project are generally consistent with the impacts of the project with the exception of potential property, social infrastructure and employment impacts. The changed project, overall, will have reduced property impacts and reduced negative impacts on social infrastructure due to its shortened alignment.

Consistent with the project, the changed project will enhance access to key social infrastructure and employment zones within and surrounding the CBD.

The proponent has committed to undertaking early and ongoing consultation with the local community as the project progresses and where required to inform the development of appropriate mitigation strategies to address construction related impacts. I am satisfied that the temporary construction impacts can be effectively mitigated and managed through compliance with the conditions that I have imposed.

Coordinator-General's conclusion

I am satisfied that the requirements of Part 4 of the *State Development and Public Works Organisation Act 1971* (SDPWO Act) have been met and that sufficient information has been provided to enable the evaluation of the proposed changes and the amendment of conditions of approval.

I consider that the changes to the project and the amended conditions stated in this report would result in acceptable overall outcomes for the project's delivery and that all potential impacts and issues raised in submissions can be adequately managed.

Accordingly, I approve the changes to the project. I have amended the imposed, stated and recommended conditions based on the changes. The appendices of the CGER are replaced by the appendices of this change report and, therefore the appendices of the CGER no longer have effect. A complete set of amended conditions are located in Appendix 1 of this report. In addition, amended recommendations are provided in Appendix 2.

In accordance with s.35 of the SDPWO Act, the report will lapse three years from the date below.

A copy of this report will be issued to the proponent and will be available on the Department of State Development website at **www.statedevelopment.qld.gov.au/crr**.

Barry Broe

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Barry Broe
Coordinator-General

8 June 2017

1. Introduction

This Coordinator-General's change report (change report) has been prepared pursuant to section 35I of the SDPWO Act and provides an evaluation of the proposed change to the project. The change application, which includes the Volume 1, Request for Project Change, Volume 2 Draft Outline Environmental Management Plan (DOEMP), Volume 3 Design Drawings (including amended Volume 3 Design Drawings), and Volume 4 Technical Reports, specifies the proposed changes to the project and are summarised in section 3.2 of this report.

This report does not re-evaluate the project as a whole. Further, it is not intended to record all the matters that were identified and subsequently settled in the project environmental impact statement (EIS). Rather, this report concentrates on the substantive issues identified during the change process undertaken by the Coordinator-General in evaluating the proposed changes to the project. The change report:

- summarises the key issues associated with the proposed changes to the project
- summarises the change process under the SDPWO Act
- provides an updated list of approvals required for the project to proceed
- presents an evaluation of the proposed changes, based on information contained in the application for change
- provides a set of amended imposed conditions under which the project may proceed
- provides a set of amended recommendations for the project.

2. About the project

2.1. The proponent

The proponent for the project is the State of Queensland, represented by the Department of Transport and Main Roads (TMR).

2.2. The project

The project is described in the CGER. The project at that time comprised:

- a new north–south passenger rail line, extending from Bowen Hills in the north over 18 kilometres (km) to Salisbury in the south
- two 10-kilometre-long parallel tunnels, extending from Victoria Park at Spring Hill to Yeerongpilly via the Brisbane Central Business District (CBD), Woolloongabba and Dutton Park
- new underground railway stations at Roma Street, Albert Street, Woolloongabba, and Boggo Road
- new surface stations at the Royal National Agriculture and Industrial Association (RNA) Exhibition Showgrounds and Yeerongpilly.

The project was declared a 'significant project' (now 'coordinated project') under the SDPWO Act on 26 March 2010.

On 28 July 2010 it was determined that the project was not a controlled action under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), if undertaken in a particular manner. Particularly, that:

- the proposed Swanbank site must be used as the spoil placement site
- the proposed tunnel alignment must not be closer than 200 metres (m) from the boundary of any building identified as occurring on Commonwealth Land and/or as a Commonwealth Heritage Listed place.

2.3. Project delivery

The *Cross River Rail Delivery Authority Act* 2016 was passed on 9 December 2016 and established the Cross River Rail Delivery Authority (CRRDA), an independent statutory body to facilitate and manage the delivery of the project.

The CRRDA became operational on 14 April 2017 and will lead the development, procurement and delivery of the project. TMR will continue to represent the project proponent during the project change assessment process.

The proponent advised by letter received on 6 June 2017 it is envisaged that there will be a transfer of responsibility for the changed project from TMR to the CRRDA. It was further advised that a notice of change of proponent may be received in due course.

3. Change report process

3.1. Application for proposed change

The proponent submitted a project change application to the Coordinator-General on 5 December 2016 requesting an assessment of changes to the project under Division 3A, section 35B, of the SDPWO Act. The project change application addresses the requirements of section 35E of the SDPWO Act, in that the written application describes the proposed changes and their effect on the project, states reasons for the proposed changes and includes enough information about the proposed change and its effects on the project to allow the Coordinator-General to make the evaluation. In accordance with section 35C of the SDPWO Act, the Coordinator-General has evaluated the environmental effects of the proposed changes, their effects on the project and any other related matters, and prepared this Coordinator-General's change report.

The provisions of the SDPWO Act dealing with changes to coordinated projects were amended by the *State Development, Infrastructure and Planning (Red Tape Reduction) and Other Legislation Amendment Act 2014*. The amendments commenced on 1 October 2014. As public notification of the EIS was carried out prior to the commencement of the amended provisions, Part 4 of the SDPWO Act in force prior to 1 October 2014 continues to apply to the project.

The application for project change requested amendments to the imposed and stated conditions contained in the CGER to reflect:

(a) changes to the project, including:
    (i) the locations of construction worksites
    (ii) spoil haulage routes and placement locations
    (iii) station locations
    (iv) the project alignment.
(b) changed environmental effects as a result of changes to the project
(c) a change in the approach to environmental management in response to the project changes and community feedback received since the CGER
(d) consequential changes to the Draft Outline Environmental Management Plan (EMP) (DOEMP).

In accordance with section 35I(2) of the SDPWO Act, I have amended the imposed, stated and recommended conditions based on the above changes. The appendixes of the CGER are deleted and replaced by the appendixes of this change report. The appendixes of the CGER no longer have effect.

The following are included in this report:

- Appendix 1 provides the imposed conditions for the project
  - Schedule 1 – Environmental Design Requirements
  - Schedule 2 - Nominated entities with jurisdiction for conditions
  - Schedule 3 - Definitions

3.2. Proponent's reasons for change

A summary of the proposed changes to the project provided in the change application dated 5 December 2016 include:

- reduction of the proposed total length of the project, from 18 km to 10.2 km, including a minor alteration to the alignment
- reduction in the proposed extent of underground tunnelling from 10 km to 5.9 km, resulting in a reduction in spoil generated from approximately 1.4 million cubic metres (Mm^3) to 0.97 Mm^3
- relocation of the Southern portal from Yeerongpilly to north of the existing Dutton Park Railway Station, removing proposed works at Yeerongpilly, Rocklea, Moorooka and Salisbury Stations
- relocation of the Northern portal so that it is located within the Exhibition Line rail corridor adjacent to the Inner Northern Busway, minimising direct impacts on Victoria Park
- relocation of the proposed Albert Street Railway Station north–west, and restricting Albert Street between Charlotte and Elizabeth Streets in the Brisbane CBD for pedestrian use only
- changes to tunnel construction methods, from bored to mined tunnelling from Woolloongabba Railway Station to Boggo Road Railway Station

- reduction in the number of surface properties requiring acquisition from 108 to 29, with no residential properties now proposed for acquisition
- demolition of the BTC (West) building due to the realignment of the Roma Street Railway Station
- change in the number of spoil placement locations from one (Swanbank) to five proposed (Brisbane Airport, Swanbank, Pine Mountain, Larapinta and Port of Brisbane)
- amendments to various to conditions to reflect the changes listed above and the revised environmental management framework.

The development schedule for delivery of the changed project is expected to be similar to that of the project, where construction is expected to take approximately five years. The estimated cost of delivering the changed project has been reduced, from $8.9 billion (2010) to $5.4 billion (2015).

Employment requirements for the changed project have also been revised as a result of the changes, where the project was expected to generate 1,600 construction jobs and 230 operational jobs. The changed project is expected to generate 1,547 construction jobs, while the operational stage would generate 576 jobs.

3.3. Public notification

In considering the project change application, submitted 5 December 2016 and updated 10 February 2017, I determined that the project should be publicly notified. The proponent's application for project change was available for public comment both online and in public locations from 25 February 2017 to 27 March 2017.

Further to a request from the proponent, requests for additional time to comment from the public and identification of the need for minor technical amendments to some of the changed project's design drawings, the Coordinator-General decided on 31 March 2017 to re-open the public notification period until 21 April 2017.

During the public consultation period, 177 submissions were received on the application for project change—27 from public organisations, 130 from private submitters and 20 from state and local advisory agencies.

The following key issues were raised during the public notification period:

- impacts on the existing freight network due to the change in project length
- impacts on local traffic and transport networks during construction
- the design and siting of the project, particularly the location of stations and integration with the existing transport networks
- human health impacts due to excessive noise, vibration and dust
- property value, use and development impacts due to surface and volumetric resumption.

On 6 June 2017, the proponent provided the following documents which I have considered in my assessment:

- Request for Project Change – Response to submissions report, June 2017

– Attachment 1: Proponent response to submissions, June 2017
– Attachment 2: Consultation report, June 2017
– Draft Outline Environmental Management Plan, June 2017
– Response to submissions: Technical note – Freight, June 2017

4. Project approvals

4.1. Australian government approvals

The Cross River Rail project was referred to the Commonwealth Minister for the Environment on 7 April 2010 under the EPBC Act and subsequently determined the project was not a 'controlled action' on 28 July 2010. Therefore approval was not required under the EPBC Act.

On 6 June 2017 the proponent referred the changed project to the Commonwealth Minister for the Environment and Energy in accordance with the provisions of the EPBC Act.

4.2. Other State government approvals

The Cross River Rail project is a major transport infrastructure project has some exemptions from assessment under the *Sustainable Planning Act 2009* (SP Act).

The Planning Act 2016 was passed in May 2016 by the Queensland Parliament and will establish a new planning system for the state. Commencing on 3 July 2017, the *Planning Act 2016* will replace the current SP Act

As a result of changes to the Cross River Rail project and regulatory changes since the release of the CGER in December 2012, I have provided a revised table of approvals to be undertaken by the proponent in the delivery of the project.

This report provides a whole of government assessment and evaluation of the project change. The proponent would be required to obtain other approvals in accordance with other legislation. Likely key approvals include:

- approval for development in the Woolloongabba and Bowen Hills PDA (ED Act)
- an Environmental Authority for concurrence and prescribed Environmentally Relevant Activities (EP Act)
- disposal permit for contaminated soil (EP Act)
- a Cultural Heritage Management Plan (ACH Act)
- approval to interfere with a railway (TI Act)

Table 4.1 provides a list of subsequent approvals that may be required for the project to proceed.

Table 4.1 Subsequent approvals that may be required for the project

Project component	Approvals/permits	Legislation	Assessment manager
Prior to construction			
Whole of project	Cultural Heritage Management Plan (CHMP)	*Aboriginal Cultural Heritage Act 2003 (ACH Act)*	Department of Aboriginal and Torres Strait Islander Partnerships (DATSIP)
Woolloongabba and Bowen Hills Station	Priority Development Area (PDA) Development Approval	*Economic Development Act 2012* (ED Act)	Economic Development Queensland, Department of Infrastructure, Local Government and Planning (DILGP)
Whole of project	Variation of accreditation of Rail Transport Operator (s113)	*Transport (Rail Safety) Act 2010*	TMR
	Amendment of safety management systems	*Transport (Rail Safety) Act 2010*	TMR
Whole of project	Risk management plan for a security-identified surface transport operation	*Transport Security (Counter-Terrorism) Act 2008*	TMR
Whole of project	Approval to interfere with a railway (s255)	*Transport Infrastructure Act 1994 (TI Act)*	Railway manager
	Chief executive may investigate potential rail corridor (s109A and s114(2))	*TI Act*	TMR

4.3. Local government approvals

The project is listed in Schedule 4 of the SP Regulation which provides an exemption for all aspects of development that may have otherwise required assessment against local government planning schemes.

5. Evaluation of the change request

In accordance with section 35I of the SDPWO Act, I have prepared this change report following an evaluation of the environmental effects of the proposed change, its effects on the project and any other related matters. I have considered input from multiple stakeholders including:

- the nature of the proposed change and its effects on the project as identified in the application for project change
- issues raised in submissions on the project change application
- other correspondence received after the submission period for the change application
- project documentation, as currently evaluated, including the CGER, the EIS, supplementary information to the EIS, and issues raised in submissions on the EIS and supplementary EIS
- technical reports
- advice from the proponent
- advice from Queensland Health (QH).

5.1. Proposed environmental management framework

The DOEMP prepared by the proponent provides the framework for environmental management in the design, construction and commissioning of the changed project.

The approach proposed by the proponent for the changed project is based on the following principles:

- environmental outcomes must be achieved through the project design, and throughout the construction and commissioning phases
  - environmental outcomes for detailed design must be achieved through satisfying the environmental design requirements
  - environmental outcomes for the construction and commissioning phases may be achieved by meeting the performance criteria or by implementation of mitigation measures developed in consultation with affected entities, or a combination of both
- performance criteria must achieve the environmental outcomes
  - to the extent practicable, performance criteria must be measurable and must achieve the environmental outcomes when implemented
  - where appropriate, performance criteria may be qualitative, or may be based on measureable goals and standards
- mitigation measures must achieve the environmental outcomes. Mitigation measures are required where predictive modelling indicates that the environmental outcomes would not be achieved. Mitigation measures must:
  - be developed to achieve the environmental outcomes whether or not they address the performance criteria. Mitigation measures may satisfy the performance criteria as a means of achieving the environmental outcome
  - be developed in consultation with affected entities, where mitigation measures at the source will not achieve the environmental outcome
  - be monitored for implementation and achievement of the environmental outcome.
- monitoring is undertaken to measure achievement of the environmental outcome. The monitoring results will inform the need for corrective actions where the environmental outcome is not achieved

- corrective actions are developed and implemented where monitoring indicates that the environmental outcome has not been achieved
- an effective and responsive complaints management system is established and maintained during construction and commissioning, with oversight by the environmental monitor and community relations monitor
- environmental reporting procedures are established to demonstrate achievement or otherwise of the environmental outcomes.

5.1.1. Construction

The construction phase is scheduled to take approximately five years. Construction will occur in stages and include:

- station box construction—approximately 15–18 months at each station location
- assembly of tunnel boring machines—approximately 3 months
- bored tunnel construction—approximately 1–1.5 years
- mined tunnel—approximately 6–12 months
- civil, structural, mechanical and electrical fit-out of stations—approximately 1–2 years.

The DOEMP also identifies that a Construction Environmental Management Plan (CEMP) will be prepared that establishes the environmental outcomes to be achieved during construction, together with related performance criteria, mitigation measures, monitoring, reporting requirements, complaints and corrective actions. The preparation of a CEMP is conditioned in Appendix 1.

I have imposed conditions (Appendix 1) for the engagement an Environmental Monitor and Community Relations Monitor to facilitate the management of the impacts of the project for the duration of construction.

The Environmental Monitor would be an independent, appropriately skilled and experienced entity, engaged for the duration of construction and responsible for:

- monitoring compliance with the imposed conditions during construction
- monitoring compliance with the CEMP and management plans
- maintain a register of mitigation measures agreed between the proponent and Directly Affected Persons (Mitigation Register)
- reviewing the compliance reports and annual reports, and provide advice to the Coordinator-General and the proponent on the contents and adequacy of those reports
- reviewing (and potentially verifying) the results of monitoring including by independent monitoring
- providing advice to the proponent about compliance with the imposed conditions for construction, including by providing the results of independent monitoring where required
- providing advice to the proponent about issues raised in complaints and the response to complaints, including advice from the Community Relations Monitor

- endorsing the CEMP as consistent with the OEMP and as complying with the imposed conditions (construction).

Similarly, the Community Relations Monitor would be an independent, appropriately skilled and experienced entity, engaged for the duration of construction and responsible for:

- reviewing and providing advice to the Environmental Monitor on the Community and Stakeholder Engagement plan
- receiving monthly reports from the proponent on complaints
- attending each meeting between the proponent and a Directly Affected Person to consult on mitigation measures, including providing input on standard responses for similar impacts
- providing advice to the Environmental Monitor in relation to complaints, community engagement and consultation on mitigation measures
- being available to members of the community.

5.1.2. Commissioning

According to the DOEMP, the commissioning phase will involve a program of testing and verification, prior to operations. During this time, all of the elements of the project will be tested individually, as coordinated systems and as an overall project-wide system. Testing will also work through the functionality, operation and integration with the existing systems and procedures of key stakeholders including the Rail Infrastructure Manager, the TMR and the Queensland Fire and Emergency Services (QFES).

The DOEMP outlines the preparation of a Commissioning EMP that establishes the environmental outcomes to be achieved by the project during its commissioning phase, supported by performance criteria to demonstrate achievement of the outcomes. The preparation of a Commissioning EMP is conditioned in Appendix 1.

5.1.3. Operation

The operation phase of the project commences upon acceptance of the project by the State Government. The project will be operated as part of the existing railway network, under the control of the Rail Infrastructure Manager (Queensland Rail). As such, an Operational EMP is not required, as the project must achieve the environmental design requirements conditioned in Appendix 1. At the completion of commissioning, the project will become a part of the existing rail network, and would be managed by Queensland Rail's Safety and Environment Management System (SEMS)

The following is an evaluation of the proposed project changes.

5.2. Land

The change application predicts that the impacts on tenure, topography, geology and soils, land contamination and land use are significantly reduced under the changed project.

The key land use changes identified within the change application are:

- reduced alignment from 18 km to 10.2 km
  - reduction in the total number of properties requiring surface and volumetric acquisition from 412 to 224 (overall surface acquisition impacts have reduced from 108 to 29 properties and overall volumetric acquisition impacts have reduced from 304 to 195 properties)
- surface works would predominately be contained within the existing rail corridor, except for station sites
- no proposed project works south of Dutton Park Railway Station
- changes to locations of proposed stations, portals and construction work sites.

The proponent has proposed that changes to the project be facilitated and delivered through a DOEMP. The DOEMP contains requirements for the proponent to prepare a final OEMP for both construction and commissioning. There are a number of sub-plans that would be developed under the CEMP relating to land including:

- acid sulfate soils (ASS) management plan
- erosion and sediment control management plan
- settlement management plan.

5.2.1. Planning framework

Since my evaluation of the project in December 2012, a number of changes have occurred across the Queensland legislative planning framework. I have provided a revised table of approvals required by the proponent in Section 4 of this report.

The project is now exempt from SP Act approvals including the requirement to obtain approval under local government planning schemes. This is stated under Schedule 4, Table 5, Item 10C of the SP Regulation. This exemption removes the requirement for the proponent to obtain approval for spoil placement which would have been an operational works approval for filling and excavation under the applicable planning scheme. Additionally, all aspects of development on a Queensland heritage place are also exempt under Schedule 4. The project will follow the statutory process for development under the QH Act.

If triggered, the proponent would be required to obtain approval under the ED Act for the Woolloongabba and Bowen Hills PDAs. The ED Act replaced the *Urban Land Development Authority Act 2007* in 2012.

5.2.2. Submissions received

There were 31 submitters who raised land use, tenure and land contamination as an issue. Seven were from organisations, including professional bodies and commercial entities, 15 were private submitters, including some Directly Affected Persons and nine from state and local agencies. Key issues raised included:

- impacts on the future development potential and capacity of directly affected sites that require a volumetric acquisition

- impacts such as noise and dust on Directly Affected Persons, including the Princess Alexandra Hospital (PA Hospital), Ecosciences building, Leukaemia Foundation ESA Village, schools and universities
- greater construction and post-construction impacts in the Woolloongabba and Dutton Park area
- impact to the Exhibition showgrounds including the construction worksite, access routes and load restrictions
- impacts to commercial properties and heritage buildings along Albert Street
- impacts to parks (Victoria Park) and loss of open space (Outlook Park)
- tunnel depth and alignment design
- contaminants at the proposed Woolloongabba Railway Station site.

I have considered each submission and how the information provided by the proponent has responded to the submitter issues as part of my evaluation below.

5.2.3. Project-wide impacts and mitigation

Property acquisition (surface and volumetric)

The change application indicates a reduction in the number of residential and commercial properties that would require a surface or volumetric acquisition. Table 5.1 shows that there will be a permanent surface requirement of five additional 'other' land-use tenure types. These have been identified as local parks and reserves.

The DOEMP prepared by the proponent in the change application identifies Brisbane City Council (BCC) as having a role in the environmental management of the design, construction and commissioning of the project change. The DOEMP states that BCC will liaise with the proponent regarding the relocation of public utilities and project design issues. I therefore recommend that the proponent work with BCC to offset the loss of public open space/pocket parks in accordance with Element 6 of the DOEMP (Nature Conservation).

Table 5.1 Revised tenure impacts[1]

Tenure and acquisition type	Project	Changed project	Difference
Surface – total	**108**	**29**	**79 less**
Residential	39	0	39 less
Commercial/industrial	60	15	45 less
Other (Park, showground)	9	14	5 more
Volumetric – total	**304**	**195**	**109 less**
Residential	235	141	94 less
Commercial/industrial	50	38	12 less

[1] Source: Request for Project Change – Volume 1, February 2017

The depth and alignment of the changed project differs slightly compared with the original project. The proposed volumetric acquisitions will impact properties at Woolloongabba, Kangaroo Point and along Albert Street between Alice Street and Roma Street, where high-density, high-rise commercial and residential developments are encouraged by the Brisbane City Plan 2014. There were nine submitters who raised concerns regarding the volumetric requirements of the changed project.

The tunnel alignment along Albert Street to Roma Street has a range of depths between 31 m to 33 m. Buildings in these locations will need to be designed to take account of the volumetric requirement. Where land is resumed, compensation will be payable to a person with an interest in the land in accordance with the *Acquisition of Land Act 1967* (AL Act).

Consistent with the project, a 'zone of influence' has been identified for the purposes of volumetric acquisition, around the tunnels and underground stations to protect the changed project from the impacts of future development. The 'zone of influence' comprises a buffer of 7 m extending from the outside of each tunnel and 10 metres from the outside of station caverns.

Management and mitigation measures

The proponent has proposed a process for volumetric acquisitions in accordance with the *Cross River Rail Delivery Authority Act* 2016 and the AL Act. The proponent informed property owners in March 2017 which properties may be directly affected by the project. For more information refer to Section 5.8 of this report (Social environment).

The proponent is committed to working with affected land owners such as the DHPW, in regard to public buildings owned by the State Government, businesses and private residential owners to provide compensation.

I expect the proponent will continue engaging with affected property owners including the registered proprietor of affected properties as required.

Coordinator-General's conclusion—property acquisition (surface and volumetric)

I am satisfied that the shortened alignment, as presented in the change application, has resulted in reduced property impacts. I note that 79 fewer properties are impacted by surface acquisition and 109 fewer properties are impacted by volumetric acquisition, compared with the original project. I note that volumetric acquisition does not change the tenure, ownership, existing use or zoning of the land at the surface. I further note that there may be impacts relating to noise, vibration and dust to nearby land users during construction. To give effect to the proposed design changes, I have imposed conditions (Appendix 1) which require that the changed project be carried out generally in accordance with the Request for Project Change February 2017 and amended design drawings, as well as achieve the Environmental Design Requirements in Schedule 1.

Topography, geology and soils

The proponent has outlined in the change application that there are slight changes to topography, geology and soils due to a change in portal and station locations and changes to the vertical profile.

Topography, settlement and erosion

There would be localised and temporary changes to topography at construction worksites. The transition from tunnel to surface infrastructure (Southern and Northern portal) has been designed within the existing rail corridor.

The change application recalculated the settlement magnitude along the alignment using a worst-case scenario. Overall, the settlement magnitude is expected to be slightly greater at Quarry Street near Park Road Railway Station and near the Victoria Barracks due to the change in alignment.

Overall the risk of erosion is lower with the change application except for the Exhibition Railway Station and the northern portal.

Possible acid sulfate soils

The change application identified that the risk of encountering possible acid sulfate soils (PASS) has increased for the changed project, due to the construction of an underpass at Mayne Rail Yard, while the removal of works south of Dutton Park Railway Station has reduced the risk of disturbing contaminated land.

Land contamination

The change application indicates that there is the potential for contaminated soil to be intercepted with the changed project. The PA Hospital, the BTC, and land parcels around the Exhibition Railway Station are listed on the Environmental Management Register (EMR). Those stations within the rail corridor such as Boggo Road Railway Station and the Northern and Southern portals are listed as a notifiable activity for rail yards and hazardous contaminants.

QH has requested to be informed of any contamination issues which may impact on the health of its staff or patients at the PA Hospital.

The presence of asbestos in buildings that are proposed to be demolished will be assessed prior to the construction tender being issued. The Dutton Park Railway Station may also contain asbestos materials identified on the Asbestos Register for Queensland Rail buildings. I note that the DOEMP outlines that, prior to the commencement of demolition and construction, the preparation and implementation of an asbestos management plan is required in accordance with relevant environmental and work health and safety requirements.

Geology

I noted in the CGER that the EIS did not identify any major obstacles to the general feasibility of the project; however, the coverage and intensity of geotechnical survey information evaluated as part of the EIS material was insufficient to complete a detailed design of a project of this magnitude. The change application stated that the project

changes would not have any changed effect on topography, geology, geomorphology and soils and no further geotechnical information was provided.

Mitigation and management measures

The DOEMP outlines that there are a number of sub-plans and management plans that would be developed under the CEMP including an erosion and sediment control management plan and a settlement management plan. I note the DOEMP includes a mitigation measure to undertake further geotechnical investigations to inform construction planning for the project.

The DOEMP prepared by the proponent includes a requirement that construction activities must avoid or minimise the environmental and public health risks from contaminated soil, groundwater or gases within soils that may be intercepted. Further site investigations would be undertaken by the proponent prior to detailed design to clarify the risks posed by contamination at each specific work area.

Coordinator-General's conclusion—topography, geology and soils

With regard to undertaking a pre-construction geology and geotechnical survey program, I note that the DOEMP includes a measure to undertake further geotechnical investigations to inform construction planning for the project.

Given the scale of the tunnelling works proposed and the location of the changed project in a heavily urbanised environment, I understand that further geotechnical information will be gathered be provided to confirm geological conditions prior to construction. As such, I require an outline of the proposed geotechnical survey program, be included within the OEMP.

In regard to ground settlement, I have imposed a condition (Appendix 1) requiring a settlement management plan. This plan is reflect the environmental outcomes, performance measures and mitigation measures listed under the geology and soils element of the DOEMP. These measures must be adopted during the project's detailed design and construction phase and in accordance with the Environmental Design Requirements listed in Schedule 1.

I have imposed a condition (Appendix 1) which requires the preparation of an erosion and sediment control plan that is consistent with the *Guidelines for Best Practice Erosion and Sediment Control* (International Erosion Control Association, 2008) and TMR's Technical Standard MRTS51 – Environmental Management. This plan must be submitted as part of the CEMP.

I note that there is the potential to disturb ASS at Mayne Rail Yard. If identified or likely to be encountered, ASS must be managed and I have imposed a condition at Appendix 1 to ensure this occurs. The proponent must manage ASS in accordance with the methods and requirements of the latest edition of the *Queensland Acid Sulphate Soil Technical Manual*.

I am satisfied appropriate contaminated land investigations have been conducted during the EIS stage and that further investigations would be undertaken prior to the detailed design stage.

I require the proponent to fulfil its commitment to ensure that contaminated land is managed and removed to approved disposal sites in accordance with the provisions of the EP Act.

Native title

Since the release of the CGER in December 2012, the Federal Court has made a determination that native title does not exist throughout an area that includes the study area (an appeal against that determination has been heard but not yet decided). The proponent has committed to consulting with the parties of the area, represented by the Jagera Daran Pty Ltd. and Turrbal Association Inc.

5.2.4. Site-specific impacts and mitigation

Southern portal—Dutton Park Railway Station

The changed project proposes moving the southern portal from Yeerongpilly to Dutton Park. The portal will now be located within the existing rail corridor between Railway Terrace and Kent Street. The reduced scale of the changed project will avoid impacts on land use and tenure that would have arisen with the project south of Dutton Park. The quantity of spoil generated by this change is reduced by 69 per cent, therefore reducing impacts on residential and commercial property owners, and on local roads due to truck movements and improving pedestrian and cycle movements.

The changed project proposed the construction of a new third platform located to the west of the existing platform at Dutton Park Railway Station, to allow trains to run express to the new Boggo Road underground station. The construction of a third platform would also allow suburban train services to pass through. This change is considered minor compared to the previously proposed underground station at Dutton Park Railway Station for the project.

Permanent land-use changes as a result of the project would be limited to the areas of surface infrastructure within the rail corridor.

Mitigation and management measures

The proponent proposes to undertake ongoing consultation with the key stakeholders involved including Queensland Rail regarding the land required for the construction worksites.

Prior to commencement of construction, the proponent would establish key management plans and procedures. These plans would be consistent with the DOEMP and the Coordinator-General's imposed conditions. Detailed site investigations would be required prior to the commencement of the project works.

Boggo Road Railway Station

The Boggo Road Urban Village (BRUV) is a science and knowledge-based research precinct made up of the Boggo Road Gaol, the Ecosciences building, residential apartments and public parkland. It is adjacent to the Boggo Road busway station and Park Road railway station. Surrounding land uses include the PA Hospital, the Leukaemia Foundation ESA Village, Dutton Park state school, Dutton Park police

station and residential apartments. The site is currently zoned ‘specialised centre (major education and research facility)’ under the BCC City Plan 2014.

Under the changed design, Boggo Road Railway Station has moved 125 m east of its location and would be located between the existing Ecosciences building and the railway corridor. This reduces direct impacts to the heritage-listed Boggo Road Gaol. The Boggo Road construction worksite has also been relocated to vacant land (Lot 2, 30 Joe Baker Street) on the eastern side of the Ecosciences building. Land proposed to be temporarily used for additional worksites and parking is located to the north of Park Road Railway Station, which is outside of the rail corridor boundary.

Temporary land use impacts as a result of construction include increased noise, vibration and dust primarily to the Leukaemia Foundation ESA Village. I note the Leukaemia Foundation ESA Village was relocated to this location in 2012 due to the development of the Queensland Children’s Hospital at South Brisbane. Potential construction impacts on the Leukaemia Foundation ESA Village are further described in Section 5.3 (noise and vibration) and Section 5.5 (air quality).

Temporary land-use changes as a result of construction would be to Lot 1 and Lot 2, 30 Joe Baker Street. Lot 1, lot 2 and the Ecosciences building within the BRUV are owned by the DHPW. The proposed station and tunnel alignment has a shallower cover north of Park Road Railway Station than the project and will limit basement design of any future development.

Permanent land-use impacts include the loss of Outlook Park as it would transition to a public plaza adjacent to the station entry.

As part of the redesign, there will be a pedestrian underpass connecting the PA Hospital, Boggo Road busway and Park Road Railway Station. The Boggo Road Railway Station would serve as an interchange between the Gold Coast/Beenleigh line and the Cleveland line at Park Road Railway Station.

Land at Joe Baker Street and part of the BRUV will be required for operational access to the Boggo Road Railway Station. On completion of construction works, land around Boggo Road Railway Station will be available for future development.

There are a number of stakeholders that will be directly and indirectly affected by the construction of Boggo Road Railway Station including:

- Boggo Road Gaol
- Commonwealth Scientific and Industrial Research Organisation (CSIRO)
- commercial offices
- DHPW
- Department of Science, Information Technology and Innovation (DSITI)
- developers
- Directly Affected Persons where a surface or volumetric acquisition is required
- Dutton Park Police Station
- Dutton Park State School
- Leukaemia Foundation ESA Village

- PA Hospital.

Mitigation and management measures

The proponent proposes to undertake ongoing consultation with affected stakeholders and those involved in the development of Lot 2 to ensure the development of stage 2 of the Ecosciences building remains viable. The proponent also proposes to consult with the operators of the PA Hospital, the Leukaemia Foundation ESA Village and the Ecosciences building to minimise and manage construction impacts.

To offset the permanent loss of Outlook Park and its playground equipment, the proponent proposes to explore opportunities to relocate park facilities in consultation with BCC. The locality is well serviced by formal and informal open space at Gair Park and Dutton Park as well as park reserve fronting Peter Doherty Street.

Woolloongabba Railway Station

The Woolloongabba Railway Station has moved 125 m east of its original location and would be located between the existing Goprint and Landcentre buildings. The site is bound by Stanley Street, Main Street, Vulture Street and Leopard Street and forms part of the Woolloongabba PDA under the ED Act.

Construction worksites would be subject to a temporary change of land use. Construction infrastructure would be contained on the one site including car parking, work sheds, spoil storage and offices. Land-use changes that have occurred since the project have included high-density development and intensification of uses around the busway station.

Permanent land use impacts include the demolition of the Goprint building, Landcentre building and Dental Hospital to facilitate the tunnelling and station construction phase compared to the project, which proposed the demolition of the Goprint building and Landcentre buildings.

The changed project improves pedestrian connectivity to the Woolloongabba busway station. The construction worksite and land-use impacts will be larger compared with the previous design. The Woolloongabba busway station adjoins the Woolloongabba Railway Station and will be volumetrically impacted above the station by a new pedestrian connection to the Woolloongabba busway station and Stanley Street. There are further opportunities for changes to pedestrian connections to Gabba Stadium, Vulture Street and the busway.

Mitigation and management measures

The PDA development scheme will need to be amended to recognise the location of the proposed station. The proponent proposes to work with Economic Development Queensland (EDQ) to integrate the project's elements into an amended development scheme and limit the potential development constraints posed by the new station.

I accept that the proponent and EDQ, in consultation with and BCC will undertake planning work for the PDA for the construction of that part of the project.

Albert Street Railway Station

The Albert Street Railway Station is proposed to be located between Margaret and Elizabeth Streets, one block north-west of the original design. The buildings on the corner of Mary Street and Albert Street will be demolished as part of the construction. As part of the proposed change, parts of Albert Street will be closed to vehicle traffic.

The proposed volumetric lot, including the buffer area, extends under the properties along Albert Street, which is zoned for high-density commercial and residential development. The tunnel could have an impact on future development opportunities along Albert Street, by limiting basement depths and deep footings for high-rise buildings.

The Albert Street worksite would require occupation of Albert Street near its intersection with Mary Street, as well as property either side of the street. There would be an acoustic shed erected over the shaft at the southern end of the cut and cover construction. Access to the worksite would be from Albert Street, at the intersection with Mary Street.

The change application proposes removing the Myer Centre car park exit on Albert Street and possibly providing alternative access to Charlotte Street between Albert Street and George Street.

Mitigation or management measures

The proponent proposes to liaise with BCC to ensure that design issues with the pedestrianisation of Albert Street are managed effectively. Any future development above the Albert Street Railway Station would be assessed as part of a separate process and would be subject to state and local government planning policies and requirements in force at the time of application.

Roma Street Railway Station

The change application proposes to relocate the station 150 m south-west from its original location. It is now proposed on the site of BTC (West Tower), which would be demolished to accommodate the station. The transit centre comprises commercial and retail businesses, a long-distance coach terminal, car parking and also provides the main access to Roma Street rail and busway stations.

The changed project includes a realignment of the tunnels between Turbot Street and Roma Street which results in a consequential change to the location of the underground Roma Street Railway Station.

The land-use impacts would involve the loss or relocation of these uses, however access to the existing rail station would not be impacted. The relocation of the long-distance coach terminal would be determined prior to the delivery of the changed project, in consultation with coach operators.

Mitigation or management measures

The BCC Masterplan identifies the BTC (West Tower) as a principal centre zone that should provide for the largest and most diverse mix of uses and activities that forms the core of an urban settlement. The project would support redevelopment of the BTC as

the new station would be designed to support a high-rise building above it. Any future development above the station would be assessed as part of a separate process and would be subject to State and local government planning policies and requirements in force at the time of application.

In consultation with TMR, the proponent will provide temporary alternative bus stops, where bus stops along Roma Street adjacent the BTC (West Tower), are disrupted.

Northern portal

The change application proposes a change in alignment to allow trains to connect with the Exhibition Line via a portal within the rail corridor rather than via a portal and transition structure in Victoria Park.

Hardgrave Park, the Northern Busway and Brisbane Grammar School (BGS) will have potential volumetric land-use impacts. There would not be a permanent land-use change to Hardgrave Park because the tunnel would be located below the park and no surface infrastructure would be permanently constructed. Small areas of Victoria Park, north and south of the rail corridor and the Inner City Bypass (ICB) corridor, currently used as a worksite and a park maintenance depot, will be temporarily impacted.

The changed location of the northern portal and the feeder station in the operational phase of the project would avoid the potential impacts on the recreation and community values at Victoria Park.

While the northern portal would be closer to Brisbane Girls Grammar School (BGGS), modelling indicates that the operational noise from the changed project would be within the planning criteria for the Exhibition Line rail corridor.

Mitigation and management measures

The revised project design would minimise impacts on cyclists travelling through Victoria Park by providing for a temporary bicycle path diversion during construction.

The DOEMP proposes that the proponent would consult with Directly Affected Persons about the programme of construction works including early works and site preparation works. In particular, consultation with residents of Gregory Terrace, businesses at the Centenary Aquatic Centre, and the administrations for each of BGGS, St Joseph's College Gregory Terrace and BGS.

Exhibition Railway Station

The Exhibition Railway Station has been relocated to the west and closer to Bowen Bridge Road. The revised location provides the same level of connectivity to the RNA showgrounds, Bowen Hills and the Royal Brisbane and Women's Hospital.

Mayne Rail Yard

The change application proposes two individual tracks on different ground-level alignments through Mayne Rail Yard with a portion of one in a trough (underpass).

One less private property would be impacted by acquisition under the changed project.

Coordinator-General's conclusion—site-specific land use

While the project would have some land-use impacts on development at Boggo Road and the CBD, it would support the achievement of a range of State and BCC city building priorities. I consider the long-term benefits such as improved travel time for commuters, reduced congestion and improved connectivity that the project would bring to Brisbane as outweighing the negative impacts of the project.

I recommend that the proponent continues to consult with the key stakeholders involved in the development of Lot 2 to minimise constraints on the planned development of the precinct.

5.3. Noise and vibration

The proposed changes to the project that would influence the predicted noise and vibration impacts evaluated in 2012 include:

- avoidance of works from Salisbury to Yeerongpilly
- reduced tunnel length, from 10 km to 5.9 km
- changed tunnelling alignment
- changed construction methodology from bored to mined tunnelling between Boggo Road and Woolloongabba railway station
- relocation of the southern portal from near Yeerongpilly Railway Station to between Dutton Park and Park Road railway stations
- relocation of the northern portal from adjacent to Victoria Park between the ICB to near BGGS in the rail corridor
- changed locations of underground stations and associated construction worksites
- changed surface track work locations
- changed proposed spoil placement sites, resulting in changed construction traffic movements and local traffic noise impacts.

The change application identified that there is potential for new sensitive receptors to be exposed to new noise and vibration impacts during both construction and operation as a result of the changes to the project. Previously identified receptors may experience reduced impacts or avoid all impacts previously identified.

Many of the mitigation measures proposed to address the impacts associated with the original project still apply to the changed project, and are outlined in the DOEMP.

The proponent has identified the need for new mitigation measures to those conditioned for the project and these have been discussed in the relevant sections below. Imposed conditions detailing required mitigation measures have also been specified where there is an inconsistency between the proponent's DOEMP and the outcomes of my evaluation.

5.3.1. Submissions received

Eighteen submitters raised noise and vibration issues. Two were from organisations, five were private submitters and 11 were from state and local agencies. The key issues raised include:

- noise and vibration impacts to surrounding receptors, including residences, health care facilities and businesses
- human health impacts resulting from excessive noise during construction
- request for consultation with parties likely to be impacted by excessive noise
- vibration impacts to sensitive equipment, including the transmission electron microscope (TEM) within the Ecosciences building at Boggo Road
- adequacy of the proposed noise and vibration assessment
- proposed noise attenuation measures
- structural impacts to heritage places.

In further response to submissions, the potential impacts to and management of cultural heritage places in the vicinity of project works is further discussed in Section 5.7 (cultural heritage).

I have considered each submission and how the information provided by the proponent has responded to the submitter issues as part of my evaluation below.

5.3.2. Project-wide impacts and mitigation

Tunnel-boring machine (low-frequency noise)

The proponent predicts that annoyance goals, as outlined in the change application, for low-frequency noise would be exceeded during tunnelling works requiring the use of TBM, an impact consistent with the project. Receptors located within a 100 m corridor of the tunnel constructed by the TBM are expected to experience exceedances of noise goals.

Low frequency noise mitigation measures include a comprehensive notification and education program to address Directly Affected Persons concerns where low frequency noise goals are likely to be exceeded. Directly Affected Persons would also be alerted to tunnelling progress and subsequent likely exposure periods. I am satisfied that the low frequency noise impacts would likely be experienced for short periods of time, and that the notification program would provide sufficient warning for sensitive receptors to prepare for the potential impacts.

Construction traffic noise

There would be fewer daily spoil truck movements required for the changed project. Truck movements for the original project were predicted to comply with the noise and vibration assessment criteria at all worksites for the project. Accordingly, it is expected that the reduced number of truck movements for the changed project would comply with relevant noise and vibration criteria. Construction traffic impacts are further discussed in Section 5.4 (traffic and transport).

Construction noise

Construction noise and vibration impacts would be generated through:

- initial cut-and-cover works during the construction of portals and underground stations
- demolition of buildings
- drilling, blasting and mining of the tunnels
- removal of spoil from underground construction sites, including noise and vibration from trucks on roads
- use of on-site plant and machinery.

The change application assessed the potential construction noise and vibration impacts of the changed project using the noise prediction models and calculation spreadsheets previously developed for the EIS. The methodology used to identify the impacts was derived from the goals established under *Australian Standard 1055.2 Acoustics - Description and measurement of environmental noise - Application to specific situations*.

Noise and vibration impacts were predicted at a range of sensitive receptors surrounding the proposed project worksites. EHP has reviewed the technical assessment documents provided in the request for project change and concluded that the assessment of noise and vibration impacts is suitable for the purposes of this assessment.

5.3.3. Site-specific impacts and mitigation

Southern portal and Boggo Road Railway Station

The changed project would relocate the southern portal from west of Crichton Street near Yeerongpilly station, to within the rail corridor north of Dutton Park Railway Station. Impacts to sensitive receptors have changed, where construction activities would be located closer to the Leukaemia Foundation ESA Village to the east of the Ecosciences building, and further away from Dutton Park State School compared to the project.

The change application predicts that construction noise would be greatest during the initial excavation of the cut-and-cover structures outside the rail corridor. When compared to the project, new airborne noise impacts generated by above-ground construction activities would be experienced at the PA Hospital, Railway Terrace and Merton Road sensitive receptors. These new impacts, when combined with the proposed night-time tunnelling works, have the potential to disrupt sleep for nearby sensitive receptors.

The change application predicts that without mitigation, daytime and night-time airborne construction noise goals would be exceeded at:

- Railway Terrace sensitive receptors by up to 19 adjusted decibels (dB(A))
- sensitive receptors north of Park Road Railway Station (Merton Road to Elliot Street) by up to 13dB(A)

- the Leukaemia Foundation ESA Village by up to 12dB(A)
- the PA Hospital by up to 9dB(A).

The change application also identifies that ground-borne noise generated through underground construction activities would increase as a result of the changes in construction methodology from bored to mined tunnelling at Boggo Road Railway Station. During the construction of the tunnel portal and the station cavern, without mitigation measures, exceedances of internal ground-borne noise goals would occur at:

- sensitive receptors north of Park Road Railway Station between Merton Road and Elliot Street by up to 17dB(A)
- the Leukaemia Foundation ESA Village by up to 4dB(A).

The change application predicts that vibration from the construction of the Boggo Road Railway Station would have the potential to impact on the operation of the TEM housed in the Ecosciences building. The change application noted that construction activities would be occurring further from the TEM for the changed project than for the original project, and it is expected that vibration would comply with the goals outlined in the change application.

Mitigation and management measures

Additional measures proposed by the proponent for the changed project include:

- three-metre-high acoustic hoarding
- where required, temporary noise barriers to be constructed adjacent to noisy plant such as rockbreakers
- where appropriate, restricting spoil removal to the daytime period
- staging of construction works to ensure predicted noise is compliant with relevant noise goals
- conducting detailed investigations to determine when drill and blast excavation could be carried out safely and efficiently, as drill and blast excavation can be controlled to limit vibration impacts resulting from rock breaking activities.

The proponent also proposes to consult with Directly Affected Persons south of Peter Doherty Street, west of Railway Terrace and the Quarry Street area north of the rail corridor to develop and implement mitigation measures for the predicted noise and vibration impacts, prior to commencing works. Should construction works exceed the identified goals, further mitigation at these sites may be required including:

- construction of a noise barrier on the north-west side of the on-site spoil route, if night-time works are required
- additional noise monitoring to the west of Railway Terrace and Joe Baker Street, as well as residences north of Park Road Railway Station, such as Quarry Street to inform requirements for additional mitigation measures.

Boggo Road to Woolloongabba tunnels

Between Boggo Road and Woolloongabba Railway Stations, the tunnelling methodology has changed from bored to mined tunnelling, involving road header and

potentially drill and blast tunnelling. The proponent expects that this change in construction methodology would reduce ground-borne noise and vibration impacts for sensitive receptors along the tunnel alignment between Boggo Road and Woolloongabba.

Noise impacts would be consistent with the project, where the CGER identified that ground borne noise exceedances with mitigation could be up to 19dB(A) at Boggo Road. The change application identified that exceedances are likely to occur during road header construction for sensitive receptors located in:

- Quarry Street
- Park Road
- Elliott Street
- Lockhart Street
- Abingdon Street
- Longwood Street
- Ross Street
- Fleurs Street
- Peterson Street
- Wilton Street
- Hubert Street.

The change application predicts that there will not be vibration exceedances causing damage for residential properties or heritage buildings for the tunnel section between Boggo Road and Woolloongabba Railway Stations. Drill and blast tunnel construction methods may be used to avoid or minimise ground-borne noise impacts and impede vibration propagation.

Mitigation and management measures

Mitigation for the identified exceedances of noise and vibration would be developed through predictive modelling, monitoring and consultation with Directly Affected Persons.

Mitigation measures proposed by the proponent to reduce the noise and vibration impacts from blasting include:

- using the latest available technology
- conducting pre-blasting condition surveys of heritage buildings
- conducting early consultation with Directly Affected Persons
- pre-warnings of blasting activities
- restricting blasting to occur between 7.30am and 4.30pm, Monday to Saturday.

Woolloongabba Railway Station to Albert Street Railway Station

Construction surface works at Woolloongabba Railway Station would occur in the same general location as the project. Impacts are predicted to be substantially similar to the original project. The CGER identified that with mitigation airborne noise goal

exceedances of up to 20dB(A) could occur at the Woolloongabba Railway Station worksite.

The change application predicts that all ground-borne noise would comply with the goals outlined in the DOEMP, during the construction of Woolloongabba Railway Station. For the section of tunnel between Woolloongabba Railway Station and Albert Street Railway Station, maximum vibration levels and ground borne noise would be higher than previously predicted. Vibration levels could reach up to 0.8 mm/s, likely to result in detectable impacts to surrounding sensitive receptors.

Mitigation and management measures

The proponent has proposed to consult in advance with Directed Affected Persons about the construction works, and to provide advance notice of the works likely to exceed the noise and/or vibration goals identified during predictive modelling. If predictive modelling indicates that exceedances of the goals are likely, mitigations measures will be required to reduce the impacts to an acceptable level. Measures could include installation of acoustic sheds and screens or barriers to protect Directly Affected Persons, including those along Vulture Street, Main Street and Stanley Streets. The need for additional mitigation measures, including upgrades to building facades such as double glazing and acoustic sealing, could be investigated.

Albert Street Railway Station

The proposed Albert Street Railway Station would be relocated from between Alice and Charlotte Streets to between Mary and Elizabeth Streets. Commercial buildings would be demolished in Albert, Charlotte and Mary Streets. Sensitive receptors along Alice Street which were previously identified to experience impacts would now comply with noise and vibration goals, due to the removal of the previously proposed Alice Street worksite.

The change application predicts that airborne construction noise impacts at Albert Street Railway Station would be similar to those previously predicted for the project. The worst case noise modelling scenario assessed noise that would be produced during demolition and piling works that would precede the construction of an acoustic shed. The proponent has advised that rock breaking in the station cavern at night would generate the highest construction ground borne noise impacts.

Exceedances of the noise goals are predicted to range from 13-27dB(A) (LA10adj) for previously identified sensitive receptors and newly impacted receptors along Albert Street towards Elizabeth Street.

When compared to the project ground borne noise and vibration impacts would increase at 70 Mary Street (Mantra on Mary) and 108 Albert Street (Oaks Festival Towers), and the associated ground floor commercial tenancies. Previously identified receptors along Albert Street towards Elizabeth Street would also experience ground borne noise and vibration impacts.

Electromagnetic impacts

In its submission, QUT raised issues about the project's potential to increase electro-magnetic fields (EMF) within the vicinity of the campus, which may impact sensitive equipment including a TEM.

The proposed alignment of the changed project would locate the tunnel over 200m horizontally from the closest QUT building. The separation distance between the closest campus buildings and the tunnel would likely limit the potential for impacts to the operation of EMF sensitive equipment.

I accept the proponent's response that the distance between the proposed tunnel and the closest QUT campus buildings would mitigate any potential increases in EMF as a result of the project. I consider that the construction work is unlikely to have a detrimental effect on the use and operation of sensitive equipment.

Mitigation and management measures

The proponent has identified that acoustic barriers and screens surrounding the worksite would be required to mitigate the potential noise impacts at the identified sensitive receptor sites surrounding the proposed Albert Street Railway Station. Night works likely to exceed noise goals provided in the DOEMP, would only occur underground or within the acoustic shed to ensure achievement of the environmental outcomes. Night works could also be conducted in accordance with the hours of extended work if agreed to by the Environmental Monitor and would have regard to the mitigation measures developed in consultation with Directly Affected Persons and 'negotiated mitigation measures'.

The proponent proposes that advanced consultation with owners and occupants of properties adjacent to station works and the tunnel corridor along Albert Street to Roma Street would also occur. Monitoring of ground borne noise and vibration along Albert Street during rock breaking construction works is also proposed at both residential and commercial premises. Alternative construction techniques, including drill and blast, will be investigated to avoid and minimise potential ground-borne noise impacts resulting from the use of heavy rock breakers.

Albert Street Railway Station to Roma Street Railway Station tunnels

The change application predicts that between Albert Street and Roma Street Railway Stations, maximum vibration levels and ground borne noise levels would be similar to those previously predicted for the project.

Ground borne noise impacts would also be experienced by new sensitive receptors in Albert Street towards Elizabeth Street. New exceedances of the night-time sleep disturbance criteria would be experienced at 450 George Street, 454 George Street and 160 Roma Street (the Abbey Apartments). The previously impacted State Law Courts would now comply with both internal noise and ground-borne noise and vibration goals outlined in the DOEMP.

Mitigation and management measures

Building condition surveys for heritage-listed places are required to be undertaken prior to the commencement of construction works, to identify any construction impacts that would arise from high levels of vibration. Additional ground borne noise and vibration predictive modelling would be undertaken during detailed design to determine the true extent of the impact, and identify additional mitigation measures which could be implemented to manage any impacts.

I have conditioned that Project Works predicted to or monitored as generating noise levels more than 20dBA ($LA_{eq(10\ min,\ ad)}$) above the relevant noise goals or vibration levels more than 2mm/s for continuous vibration and 10mm/s for transient vibration will only occur between 7.00am and 6.00pm with respite period. Mitigation measures could also be developed through consultation with sensitive receptors. Alternative construction techniques may be available (e.g. drill and blast) to avoid the use of heavy rock breakers.

Roma Street Railway Station

Due to the relocation of the Roma Street Railway Station worksite, the Roma Street Railway Station Hotel (Hotel Jen) would now comply with airborne noise criteria. Sensitive receptors along Parkland Boulevard which were previously identified to experience exceedances of airborne noise goals would now comply, due to the change in the worksite location.

Potential noise impacts

The change application predicts that air borne noise exceedances would be greatest during demolition and initial site excavation works. Ground borne noise impacts are predicted to increase from the project, due to the new location of the station cavern and shaft. Rock breaking during night-time works is predicted to result in the greatest exceedances of ground borne noise goals.

Without mitigation, the following properties would experience exceedances of daytime and night-time airborne construction noise goals:

- BTC (East Tower) by up to 8dB(A)
- Roma Street (Abbey Apartments) residential receptors by up to 7dB(A)
- Queensland Police Headquarters and Watch House by up to 7dB(A)
- St Alban Catholic Church by up to 7dB(A)
- Supreme and District Courts by up to 5dB(A)
- Wickham Terrace Residential by up to 3dB(A).

Without mitigation, internal ground borne noise exceedances during the construction of the station cavern would also occur for:

- the Roma Street (Abbey Apartments) by up to 10dB(A) during the night.
- the Roma Street Railway Station commercial building by up to 2dB(A) during the day
- the BTC (East Tower) by 2dB(A) during the day
- the BTC (West Tower) by 2dB(A) during the day

- Roma Street commercial buildings (King George Chambers) by 1dB(A) during the day.

Mitigation and management measures

The proponent's possible mitigation measures include the construction of a ventilated acoustic shed over the station shaft and spoil loading facilities to reduce noise levels predicted to be above the relevant noise goals outlined in the change application. Additionally, night-time works likely to exceed the noise goals would only be conducted underground or within the acoustic shed. Night works would also be conducted in accordance with the hours of extended work if agreed with the Environmental Monitor. This would have regard to the extended work hours agreed upon by the Environmental Monitor, through consultation with sensitive receptors. Alternative construction methods would also be investigated.

Roma Street Railway Station to northern portal tunnels

Between Roma Street Railway Station and the northern portal, maximum vibration levels and ground-borne noise levels would be similar to those previously predicted, although in different locations due to the change in tunnel alignment.

The change application predicts that noise goal exceedances would occur for short periods of time, likely less than one week, during the TBM passby. Potential vibration levels may not result in a disturbance impact to building occupants.

Although likely to experience a 0.2mm/s increase in vibration and a 4dB(A) increase in ground borne noise compared to what was previously predicted for the project, the BGGS would remain compliant with the human comfort vibration goal for educational facilities.

Heritage building vibration criteria would also be compliant at the Victoria Barracks.

Mitigation and management measures

For Roma Street Railway Station, the proponent proposes similar mitigation measures to those required for the construction of Albert Street Railway Station, including:

- conducting building condition surveys
- restricting hours of work
- performing noise and vibration trials
- investigating alternative construction methods.

Northern portal

The northern portal and its associated worksite would be relocated within the existing Exhibition loop rail corridor. The impacts to sensitive receptors along Gregory Terrace previously identified for the project would be avoided as a result of the changes. Construction works however, would be located closer to BGGS.

Without mitigation, site establishment, piling, trough excavation and cut and cover works are predicted to generate the greatest noise and vibration impacts at the northern portal worksite.

The change application predicts that exceedances of construction airborne noise goals in the vicinity of BGGS would be by 7dB(A) during site establishment and 3dB(A) during trough excavation and cut and cover construction. BGS would experience exceedances of noise goals during site establishment by 2dB(A).

There are no predicted impacts resulting from ground borne noise or vibration for any sensitive receptors surrounding the northern portal.

Mitigation and management measures

The proponent stated that construction works occurring close to BGGS would require careful site management based on consultation with the school. The proponent proposes to consult in advance with Directly Affected Persons, particularly:

- the administrators of BGGS, St Joseph's College Gregory Terrace and BGS
- residents of Gregory Terrace
- businesses at the Centenary Aquatic Centre.

Prior to the commencement of works predicted to exceed the noise and vibration goals, acoustic barriers and ventilation sheds may be constructed to provide mitigation for TBM retrieval and spoil removal.

Additional mitigation measures would include:

- further assessment of potential impacts during detailed design
- regular liaison with BGGS
- noise monitoring at BGGS during construction.

The change application concluded that construction noise modelling at BGGS would inform further mitigation measures to be developed in consultation with the school.

Exhibition Railway Station

The changed project is not expected to have any additional construction noise and vibration impacts at the new Exhibition Railway Station. Mitigation measures for potential impacts would be developed in accordance with the project's DOEMP.

Mitigation and management measures

The proponent identified that predictive modelling and ongoing consultation with surrounding residents, business owners and occupants and the RNA would inform the need for mitigation measures at Exhibition Railway Station. Building condition surveys would also be undertaken for heritage-listed places likely to experience exceedances of vibration goals during construction as per the DOEMP.

Mayne Rail Yard

The project proposed the construction of southbound flyover tracks providing a connection for the project to the North Coast Line through Mayne Rail Yard.

The changed project would remove the need for the flyover, replacing it with an underpass for southbound services. Although construction works would be more intense at Mayne Rail Yard for the changed project, the change application predicts

compliance with construction noise and vibration management goals. As the nearest sensitive receptors are located at distances from the worksite greater than the required minimum setback distance of 200 m, exceedances of goals are unlikely.

Operation impacts

Ground-borne noise would be produced during the operation of the project, as a result of dynamic forces at the wheel-rail interface. Vibration would propagate through the ground or track support structures and may be experienced by occupants of nearby buildings as either ground-borne noise or tactile vibration.

The change application identified the planning levels for operational railway activities, consistent with Queensland Rail SEMS, as:

- 65dB, evaluated as the 24 hour average equivalent continuous A-weighted sound pressure level [$LA_{eq(24hour)}$]
- 87dB Single Event Maximum (SEM), evaluated as a SEM sound pressure level (LA_{max}).

I am satisfied that the assessment of potential operational noise and vibration impacts of the project against the Queensland Rail SEMS is adequate, and accurately identifies the project's compliance with the operational noise goals.

Southern portal and Boggo Road Railway Station

Based on the change in the predicted daily train movements between the project and the changed project, operational rail noise levels experienced at the southern portal would vary by –6dB(A) to +1dB(A).

In 2026, operational rail traffic noise levels are predicted to exceed Queensland Rail SEMS planning levels at the southern portal by:

- 4dB(A) [$LA_{eq(24hour)}$] and 5dB(A) LA_{max} in 2026
- 5dB(A) [$LA_{eq(24hour)}$] and 5dB(A) LA_{max} in 2036.

The change application concluded that the changes to the location of the southern portal would result in 25 fewer sensitive receptors likely to experience operational rail noise in excess of Queensland Rail SEMS planning levels. However, without mitigation, twelve receptors would still exceed the planning levels in 2026 and 2036 by up to 5dB(A) as a result of the changes.

The 12 receptors that would experience exceedances of the goals would include:

- nine residences along Railway Terrace
- two residences along Rawnsley Terrace
- the Leukaemia Foundation ESA Village.

Mitigation and management measures

Mitigation of the predicted exceedances would require further discussion and assessment with the Directly Affected Persons, during the detailed design phase.

Additional mitigation measures could include:

- raising the existing railway noise barrier along Railway Terrace to a maximum height of six m to reduce predicted noise levels by up to 8dB(A), providing mitigation for four of the sensitive receptors identified at the southern end of Railway Terrace
- ongoing engagement with affected parties where operational noise goals cannot be achieved through the provision of noise barriers
- further investigation and consultation with the sensitive receptors during detailed design.

Among the eight receptors that would remain non-compliant with Queensland Rail SEMS planning levels would be the Leukaemia Foundation ESA Village. Investigations indicate that a noise barrier is not a feasible solution to the exceedance predicted. It has been assumed that due to the recent construction of the building, appropriate noise mitigation would have been incorporated into the building's façade. The proponent has indicated that determining whether this is the case would be the first step in investigating how to manage operational rail noise at this site.

Southern feeder station and ancillary facilities

The changed project would relocate a smaller scaled electrical sub-station from Yeerongpilly to a site on railway land between a freight overpass and the Beenleigh and Cleveland rail lines.

The change application predicts that noise levels from the feeder station and ancillary facilities would reach up to 35dB(A), which is compliant with the relevant noise goal of 40dB(A).

Boggo Road to Woolloongabba tunnels

The change application predicts that there would be no operational airborne noise impacts for surrounding sensitive receptors during the operation of the project for this section of tunnel.

Ground-borne noise is predicted to be within the relevant criteria for all identified sensitive receptors, particularly under the most stringent night criteria of 35dB(A) for all building types.

The use of direct fixation, resilient and highly resilient track fasteners has been proposed to ensure operational noise and vibration impacts are managed. Track fasteners would act to stabilise the connection between the tracks and the tunnel surface, reducing the potential for movement, therefore reducing the noise and vibration impacts.

Accordingly it is expected that the changed project would comply with the ground borne noise and vibration criteria at all receptors through the application of highly resilient rail fasteners.

Woolloongabba, Albert Street and Roma Street Railway Stations

The change application predicts that there would be no change to the predicted operational airborne noise impacts for:

- Woolloongabba Railway Station

- Albert Street Railway Station
- Roma Street Railway Station.

For Albert Street Railway Station, no operational impacts from ground borne vibration to the Royal Albert Apartments on the corner of Elizabeth and Albert Streets were identified.

The relocation of Roma Street Railway Station would also relieve the previously predicted operational ground borne noise impacts to the apartments on Parklands Boulevard. Between Roma Street to BGGS and between Centenary Pool to Bowen Hills, there may be an improvement in LA_{eq} noise levels.

The change application concluded that, providing that resilient and highly resilient track fastening systems are installed, there would be no exceedances of operational ground borne noise and vibration goals at Woolloongabba, Albert Street or Roma Street Railway Stations.

Northern portal

The change application identified that the changed location of the northern portal would introduce a new additional source of operational rail noise for the BGGS, while removing noise impacts from the Centenary Pool.

The change application predicts that operational rail traffic airborne noise levels in 2026 and 2036 would comply with the identified planning levels at the sensitive receptors, including BGGS. Accordingly, no further mitigation has been proposed. Provided that rail track fastening systems are implemented, there would also be no exceedances of ground borne noise and vibration at sensitive receptors.

Exhibition Railway Station

The change application predicts that there would be a reduction in ground-borne noise impacts during the operation of the project at Exhibition Railway Station, based on reductions in predicted rail freight traffic through that section.

It is expected that there would be no exceedances of SEM planning noise levels due to freight movement through the Exhibition area. There would also be no noticeable increase in background noise levels as a result of increased passenger rail movements on the Exhibition line due to the project.

Due to the removal of the proposed feeder station north of Lanham Street at Bowen Hills, there would now be no airborne noise impacts at sensitive receptors within that locality.

Mayne Rail Yard

There would be no change in operational airborne rail noise effects within Mayne Rail Yard compared with the project.

Feeder stations

The southern feeder station would be a smaller scaled electrical substation and located closer to sensitive receptors than the project. All components of the southern feeder

station would be enclosed, with the transformer building open in the direction of the tracks.

The predicted worst case noise impacts from feeder stations would be consistent with the project at less than 35dB(A)LA_{90}, therefore compliant with the 40dB(A)LA_{90} goal.

Station ancillary facilities

Due to the change in location of the Boggo Road and Roma Street Railway Stations, airborne station ancillary facility (i.e. ventilation outlets, air-conditioning vents) noise likely to be produced was reassessed. The change application reported that there would be no change in predicted maximum acceptable noise emissions for the station ancillary facilities at Woolloongabba and Albert Street Railway Stations.

The change application predicts compliance at nearest sensitive receptors to the Boggo Road and Roma Street Railway Stations ancillary facilities, provided that maximum noise emission levels do not exceed 85dB(A) and 88dB(A) respectively.

Further assessment during detailed design would be required to verify the noise emissions from these facilities and develop appropriate mitigation measures.

5.3.4. Coordinator-General's conclusion

Construction

I am satisfied that the assessment has identified the construction noise and vibration impacts for the changed project.

I note that multiple submitters raised issues with the potential construction noise and vibration impacts to surrounding sensitive receptors, and the potential for human health impacts due to high levels of construction noise. Furthermore, in its submission, QH requested that the mitigation measures for construction noise and vibration impacts recognise values for sensitive health receptors.

In response, the proponent advised that the noise goals, as detailed in the DOEMP and the change application, have been developed with consideration of World Health Organisation Guidelines, Australian Standards, the *Queensland Rail Safety and Environmental Management System* and recent infrastructure projects undertaken in Brisbane. I understand the proponent will consult with the operators of the PA Hospital, the Leukaemia Foundation ESA Village and the Ecosciences building to minimise and manage the effects of construction to sensitive health facilities. Due to the highly sensitive occupants of the PA Hospital and the Leukaemia Foundation ESA Village, I note the proponent is committed to consulting with Directly Affected Persons to minimise and manage any effects of construction to sensitive health facilities.

In order to ensure noise and vibration is managed to avoid human health impacts during the construction of the project, I have imposed a condition (Appendix 1) to monitor and manage noise and vibration impacts from the changed project to ensure the environmental outcomes for noise and vibration are achieved.

I have also imposed a condition (Appendix 1) which sets requirements for the proponent to manage blasting and providing advance notice to persons who may be adversely affected.

Additionally, I have imposed a condition (Appendix 1) requiring the proponent to develop a noise and vibration management plan as part of the OEMP. I expect that Noise and Vibration Management plans for all construction worksites are developed in accordance with the mitigation and management measures outlined in the DOEMP provided by the proponent. The Noise and Vibration Management plans should include:

- a description of the works programme to which the management plan relates, together with a schedule of revisions where the sub-plan has been amended progressively to address the on-going works programme
- background noise monitoring that informs predictive modelling undertaken in the vicinity of construction sites adjacent to sensitive receptors
- a requirement for predictive modelling on which to base mitigation measures for noise and vibration from construction works. Predictive modelling must address the proposed construction methods in relation to the ground conditions in the work area, and identify nearby sensitive receivers
- an outline of the comprehensive program of noise and vibration monitoring for each worksite, based on proximity to residences or other sensitive receptors. Monitoring must be conducted in locations where predictive modelling indicates exceedances of either the noise or vibration goals could occur
- specific monitoring points for the construction noise and vibration from the proposed works
- measures for investigating alternative construction techniques, including drill and blast, to avoid and minimise potential ground-borne noise impacts resulting from the use of heavy rock breakers
- clear criteria for monitoring compliance with the Coordinator-General's conditions and the agreed mitigation measures relating to the proposed works.

The Noise and Vibration Management plan in the OEMP will incorporate mitigation measures, including:

- installing acoustic screens as early as practicable around potential noise sources, or placing noise sources in the worksite so that effective acoustic screening is achieved
- installing ventilated acoustic sheds over work areas likely to generate sustained levels of elevated noise, and dust. Such work areas are likely to include station excavations, tunnelling launch sites (e.g. portal and segment handling), and spoil handling and transfer sites
- using the quietest plant and equipment available
- regular maintenance to ensure that all plant and equipment remains in good working order
- minimising the coincidence of noisy plant and equipment working simultaneously near sensitive receptors
- fitting residential class mufflers to mobile plant and equipment

- ensuring careful placement of fixed plant within each worksite to maximise shielding or separation from sensitive receptors
- minimising use of warning devices on plant and equipment
- conducting surveys in the locality to identify residential properties and other places especially sensitive to sleep disturbance, such as hospitals, nursing homes and child care centres
- conducting surveys in the locality to identify and determine the specification for building equipment known to be sensitive to vibration, such as computers, microscopes, surgical equipment
- conducting pre- and post-construction building condition surveys where potential cosmetic building damage could occur as a consequence of construction works.

As part of the Noise and Vibration Management plans, I also expect that, where predictive modelling indicates a potential exceedance of either the noise or vibration goals relative to human health and wellbeing, the proponent informs the Environmental Monitor and consults with Directly Affected Persons to develop and agree mitigation measures prior to the commencement of such work. Such mitigation measures should then become the monitoring criteria for the works in that locality and be included in the relevant noise and vibration management plan.

I expect the Noise and Vibration Management plan to include provisions requiring night-time works likely to exceed the relevant goals to be conducted only within acoustic enclosures and/or sheds. Night-time works likely to exceed the noise goals may be conducted only underground or within the acoustic shed except during extended hours agreed with the Environmental Monitor. In agreeing to extended hours the Environmental Monitor would have regard for the mitigation measures agreed with the Directly Affected Persons.

I note multiple submitters requested that the proponent provide consultation with parties likely to be affected by excessive noise. In consideration of these concerns, I have Imposed a condition (Appendix 1) requiring the proponent to provide early and on-going consultation with all Directly Affected Persons about project works, predicted impacts and mitigation measures as part of the community engagement plan. Consulted Directly Affected Persons should include, but not be limited to, those sensitive receptors identified in the construction noise and vibration section within the DOEMP for each construction worksite location.

I recommend the proponent consult with relevant advisory agencies in the development of mitigation measures for predicted and monitored noise and vibration impacts above the goals for the CEMP. I consider that consulting with relevant advisory agencies prior to endorsement by the Environmental Monitor would ensure potential noise and vibration impacts are addressed through appropriate mitigation measures

I am satisfied that the imposed conditions, environmental outcomes, performance criteria, and the application of the mitigation measures through the CEMP would ensure community concerns are satisfactorily addressed.

Operation

I am satisfied that the change application has identified and assessed the potential noise and vibration impacts generated by the project during its operation.

As outlined in the DOEMP the proponent has advised that the project must achieve the Environmental Design Requirements for noise and vibration. Once operational the project will become part of the existing rail network under the control of the Rail Infrastructure Manager.

Accordingly, I have imposed a condition (Appendix 1) requiring that the project must be designed to achieve the Environmental Design Requirements in Schedule 1, particularly those relating to noise and vibration. This includes noise and vibration criteria, which I require the proponent to achieve through the operation of the project. I have also imposed a condition (Appendix 1) requiring the proponent to provide written notice to the Coordinator-General that the project has achieved the Environmental Design Requirements at the completion of commissioning.

Of particular concern is the predicted operational noise impact to the Leukaemia Foundation ESA Village. The Rail Infrastructure Manager will consult with affected parties such as the Leukaemia Foundation ESA Village, and nearby sensitive receptors, especially the PA Hospital, who may experience exceedances of noise and vibration goals, in the development of mitigation measures consistent with the DOEMP to address the identified impacts. I am satisfied that consultation with the affected parties would assist in the development of mitigation and management measures to address the identified operational noise impacts.

As part of the Commissioning EMP the proponent will undertake verification that the project has achieved the Environmental Design Requirements, including for operational noise.

I also expect the proponent to fulfil their commitment to monitoring noise and vibration generated by train movements during the commissioning phase to ensure that the Environmental Design Requirements have been satisfied.

5.4. Traffic and transport

The change application outlines that the changed project will result in an overall reduction in potential impacts on traffic, pedestrian and cycle movements compared to the project. The key traffic and transport changes to the project are discussed below.

5.4.1. Submissions received

Forty-eight submitters raised traffic and transport matters as an issue. Twenty were from organisations, including professional bodies and commercial entities, 21 were private submitters and seven from state and local agencies. Key issues raised include:

- potential footpath and bikeway impacts during construction
- potential impact of project construction activities on rail freight movements
- potential impact on the movement of freight on the rail network
- potential local traffic impacts especially during construction

- potential impacts of spoil haulage on the road network and uncertainty regarding spoil disposal locations
- pedestrian connectivity and linkages between proposed and existing station infrastructure.
- potential impacts to bus operations including stations during construction

I have considered each submission and how the information provided by the proponent has responded to the submitter issues as part of my evaluation.

5.4.1. Project-wide impacts and mitigation

The key traffic and transport changes that arise due to the proposed changes to the project relate to:

- spoil haulage and materials delivery
- construction workforce traffic and parking
- pedestrian and cyclist movement
- local traffic and bus operations
- freight capacity.

Changes to the alignment

The change application outlines that the length of the project including the twin tunnels reduce from approximately 10 km to 5.9 km, with the tunnels to be mined instead of bored between Boggo Road and Woolloongabba Railway Stations, which reduces the number of tunnel boring machines from four to two.

The change application outlines that the project will now connect with the surface rail network near the existing Dutton Park Railway Station in the south. Relocating the Southern portal from Yeerongpilly to Dutton Park removes the need for surface works south of the Dutton Park Railway Station including the proposed station at Yeerongpilly, specifically the potential impacts on Wilkie Street and other local roads adjacent to the Yeerongpilly Railway Station. In the north, the changed project will include a new and realigned surface track through Mayne Rail Yard to connect the changed project with the North Coast Line between Breakfast/Enoggera Creek and Albion Railway Station.

The change application also includes a variation in the horizontal alignment of the route between Dutton Park and Woolloongabba to accommodate both the changed southern connection and maintain rail track grade requirements. The route also changes between Woolloongabba and Albert Street to accommodate the track grade requirements and allow the tunnels to pass beneath the Brisbane River in the same location as the project in stable rock conditions.

North of the relocated proposed Albert Street Railway Station, the route changes to accommodate a new location for the Roma Street Railway Station under the BTC site. The changed project route then moves further west before heading north beneath Countess Street and Hardgrave Park to connect with the surface rail network on the Exhibition Line. A single new track would be provided along the Exhibition Line providing a connection from the northern portal to Mayne Rail Yard.

Construction workforce traffic and parking

Consistent with the project, construction workforce traffic and parking has the potential to inconvenience local residents and cause potential traffic impacts over the long construction period. The change application identifies that, for all construction worksites combined, approximately 704 parking spaces will be provided, which is a reduction of 154 parking spaces compared to the 858 parking spaces proposed for the project.

Table 5.2 below provides a general comparison of the construction worksites between the project and changed project as indicated in the change application.

Table 5.2 Comparison of workforce parking at worksites [2]

Location	Project	Change application	Difference
Salisbury to Yeerongpilly	Station worksites at Salisbury, Moorooka and Yeerongpilly	No works proposed	No works now proposed in this location
Southern ventilation shaft	Worksite at Fairfield Road and Bledisloe Street	No works proposed	No works now proposed in this location.
Southern portal	464 on-site parking spaces at worksite at Yeerongpilly Railway Station with access of Wilkie Street	115 on-site parking spaces at worksite within existing Queensland Rail compound between PA Hospital and rail corridor	Change application requests a reduction of 349 spaces however portal location has changed from Yeerongpilly to Queensland Rail compound between PA Hospital and rail corridor
Boggo Road Railway Station	30 on-site parking spaces at worksite between Boggo Road Gaol and Ecosciences building	45 on-site parking spaces at worksite located between the rail corridor and Joe Baker Street	Change application requests 15 additional spaces in this location
Woolloongabba Railway Station	72 on-site parking spaces at worksite at the existing GoPrint site	300 on-site parking spaces at worksite at the existing GoPrint site	Change application requests 228 additional spaces in this location
Albert Street Railway Station	0 on-site parking spaces at worksite off Albert Street and Charlotte Street	0 on-site parking spaces at worksite on Albert Street, between Mary Street and Elizabeth Street	No change

[2] Source: Request for Project Change – Volume 1, February 2017

Location	Project	Change application	Difference
Roma Street Railway Station	45 on-site parking spaces at worksite at eastern end of existing Roma Street station	45 on-site parking spaces (estimated as data not provided) at worksite at BTC (West Tower) and additional laydown area within car park area (off Parkland Crescent)	No change
Northern portal	80 on-site parking spaces at worksite at existing BCC temporary staging facility and Queensland Rail workshop shed at eastern end of Victoria Park	154 on-site parking spaces at main worksite within the rail corridor near the northern portal and a smaller worksite at existing BCC temporary staging facility. Additional laydown area off Gilchrist Avenue	Change application requests 74 additional spaces in this location
Exhibition Railway Station	45 on-site parking spaces at worksite at O'Connell Terrace at east of road-over-rail bridge	45 on-site parking spaces at worksite in similar location to project	No change

The change application indicates a peak parking demand of 2,932 parking spaces based on an assumption that each worker would drive, compared to 2,200 for the project.

Coordinator-General's conclusion

Workforce parking and associated management for surrounding residential or commercial areas, addressing issues such as safety, access and amenity must be comprehensively addressed in the OEMP and sub-plans after significant consultation with BCC.

I have therefore imposed a condition (Appendix 1) requiring the proponent to finalise and submit for my approval six months prior to commencement of project work an OEMP that includes construction traffic and worksite management sub plans to ensure this matter is appropriately managed to reduce impacts in residential and commercial areas.

The OEMP will include possible mitigation measures such as:

- outline parking and travel arrangements for the construction workforce
- identify measures to avoid worker car parking and access in local streets near construction worksites
- address safety, access and amenity for both workers and the local community

- describe any proposals to shuttle workers to or from other worksites
- identify any restricted areas or times where different worker procedures apply
- identify parking control arrangements in consultation with BCC
- address changing worksite demands during the construction programme.

Construction traffic and spoil haulage

Overall, the change application indicates that the construction of the requested changes to the project are expected to result in potential impacts to existing traffic conditions consistent with the project. The quantity of spoil generated by the changed project (0.97 Mm^3) would be less than anticipated for the project (1.4 Mm^3) due to the shortened tunnel length.

In response to a decision under the EPBC Act by the former Commonwealth Department of Environment, Water, Heritage and the Arts (EPBC 2010/5427), the project proposed to collect construction spoil and transport it by road to a placement site at Swanbank, approximately 36 km to the south west, which would require a round trip of approximately 72 km from most of the project worksites.

The peak daily spoil truck movements for the changed project will generally be lower than those for the project as detailed in Figure 5.1. The exception to this is Mayne Rail Yard, where spoil truck movements would increase for the changed project due to excavation of an underpass.

Construction Worksites	Peak Spoil Movements (Loads / Day)		Peak Delivery Movements (Loads / Day)	
	Reference Project	Changed Project	Reference Project	Changed Project*
Tunnelling works				
Southern Portal	214	12	57	20
Ventilation Facility (Fairfield)	29	n/a	8	n/a
Boggo Road	89	46	24	24
Woolloongabba	214	142	57	57
Albert Street	80	32	21	21
Roma Street	103	39	27	27
Northern Portal	75	31	20	20
Surface works				
Clapham Yard	-	-	143	-
Mayne Yard	-	20	143	100
Exhibition	-	-	60	60
Totals	**804**	**322**	**560**	**329**

Note: The estimated peak daily construction traffic does not include traffic associated with demolition activities.
* Determined to be similar to Reference Project, except Mayne Yard, which was reduced due to a change in design (construction of an underpass/trough structure in place of a viaduct).

Figure 5.1 Peak spoil and delivery vehicle movements[3]

The change application identifies five potential spoil placement sites which include:

- Brisbane Airport (Lomandra Drive & Sugarmill Road)

[3] Source: Request for Project Change – Volume 1, February 2017

- Swanbank, Swanbank Road
- Pine Mountain, Pine Mountain Road
- Larapinta, Paradise Road
- Port of Brisbane, Port Drive.

Of these potential five spoil placement sites, the proponent has indicated that Brisbane Airport, Swanbank and Pine Mountain (Mt Gravatt) are the preferred spoil placement sites with Larapinta and Port of Brisbane to be alternative sites if the preferred sites are unavailable. The general haulage routes for the spoil sites are listed below:

- Brisbane Airport site—the proposed spoil truck routes vary depending on the origin of the worksite but would generally make use of CLEM 7, Airport Link, East-West Arterial Road, Airport Drive, Lomandra Drive and Sugarmill Road
- Swanbank site—spoil haulage from the worksites will be primarily via Ipswich Road and Ipswich Motorway for the worksites south of the Brisbane River or via the ICB, Milton Road/Legacy Way, Western Freeway and Centenary Highway for worksites to the north. Both routes will continue on to Ipswich Motorway, Cunningham Highway and Swanbank Road
- Pine Mountain site—spoil haulage would follow:
  - southern portal, Boggo Road and Woolloongabba worksites: via Ipswich Road, O'Keefe Street, Old Cleveland Road, Creek Road and Pine Mountain Road
  - north of the Brisbane River worksites: via ICB, Hale Street, Riverside Expressway, Vulture Street, Ipswich Road, O'Keefe Street, Old Cleveland Road, Creek Road and Pine Mountain Road
- Larapinta site—spoil haulage would follow:
  - ICB, Legacy Way, Western Freeway, Centenary Highway and Logan Motorway
  - Pacific Motorway, Logan Road, Gateway Motorway and Logan Motorway
- Port of Brisbane site—spoil haulage would follow:
  - Ipswich Road, O'Keefe Street, Old Cleveland Road, Gateway Motorway and Port of Brisbane Motorway
  - Riverside Expressway, Vulture Street, Wellington Road, Wynnum Road, Lytton Road and Port of Brisbane Motorway.

Coordinator-General's conclusion

Submissions on the change application raised concerns with the haulage of spoil on the road network, especially regarding the safety of other road users such as cyclists and pedestrians. I have therefore imposed a condition (Appendix 1) which requires the proponent to prepare and submit a road safety assessment as part of its final OEMP which must be submitted for my approval six months prior to commencement of project work.

Potential pavement impacts as a result of spoil haulage were also raised in a submission by local government. I recommend the proponent, in consultation with BCC, develop mitigation measures addressing any assessed pavement damage on local roads caused by the changed project spoil haulage vehicles.

Given the inclusion of additional spoil disposal locations at Brisbane Airport, Pine Mountain, Larapinta and Port of Brisbane in the change application and the concerns raised in submissions regarding spoil haulage, a comprehensive approach to heavy vehicle management is required.

I am satisfied that the potential impacts of the project changes relating to spoil haulage and materials delivery have been identified. To ensure the potential impacts are within acceptable limits, I have imposed a condition (Appendix 1) requiring the proponent to finalise and submit for my approval six months prior to commencement of project work an OEMP which may include possible mitigation measures including:

- real-time monitoring of spoil haulage 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, 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 route
- spoil haulage vehicles to be clearly marked, including a visible project contact phone number
- maintaining all haulage vehicles to relevant Australian Design Rules
- ensuring all vehicles leaving a construction worksite pass over or through devices that removes loose soil and other debris before entering a public road
- ensuring all vehicles and equipment is well maintained to minimise combustion generated emissions and manage $PM_{2.5}$ levels
- driver code of conduct to be established that includes detail on approved haulage routes, safety, courtesy and amenity.

I have also imposed conditions (Appendix 1) to avoid, mitigate or manage the potential impacts on transport networks and local communities.

Pedestrian and cyclist movement

Consistent with the project a number of submissions on the changed project raised concerns regarding the potential for impacts on pedestrian and cyclist movement, especially during construction. The changes in station locations has the potential to impact on pedestrian and cyclist movements during the operational phase, especially at Boggo Road, Roma Street and Albert Street. I consider the proposal to close a section of Albert Street to vehicle traffic, will have a positive impact on pedestrian and cyclist movement in the CBD. The change application indicates that the changed project includes a pedestrian connection between the proposed Boggo Road Railway Station and the PA Hospital, which is a positive outcome for pedestrian connectivity in this locality.

Coordinator-General's conclusion

I am satisfied that the potential project changes on pedestrian and cyclist movement have been identified and assessed. I have imposed a condition (Appendix 1) that requires project construction traffic to be managed to avoid or minimise adverse

potential impacts on pedestrian and cyclist safety. I have also imposed a condition (Appendix 1) that requires the proponent to finalise and submit for my approval an OEMP six months prior to commencement of project works that will include specific pedestrian and cyclist movement mitigation measures.

Local traffic and bus operations

The proposal to permanently close a section of Albert Street (between Mary Street and Elizabeth Street) will result in a local redistribution of traffic to other parts of the CBD network. The change application indicates that this traffic redistribution would be confined to local traffic accessing CBD establishments and would not impact the Riverside Expressway. There would be no direct impacts on bus routes as no bus services operate in this section of Albert Street. Key intersections in the vicinity of the proposed Albert Street closure were assessed by the proponent in their change application for the AM and PM periods to assess potential traffic impacts.

The assessment outlined that most intersections are forecast to operate well within acceptable levels for both peak periods, except for the intersection of George and Elizabeth Street which was forecast to exceed capacity limits in both AM and PM peak periods as a result of traffic rerouting from Albert Street to George Street. The potential impact results from greater demand for the right turn movement from George Street into Elizabeth Street, causing queuing delays for this movement.

The proposed mitigation measure identified by the proponent is to convert the centre lane into a shared through and right turn from George Street into Elizabeth Street. This will increase the available right turn capacity such that in the AM and PM peaks the intersection level of service will be within acceptable levels.

The change application indicates that the demolition of the BTC (West Tower) at Roma Street will necessitate the closure and relocation of the long distance coach terminal from its existing site and the demolition of the existing car park with the loss of approximately 600 car parking spaces.

The BTC car park is principally used by tenants of the BTC (West Tower) as well as some paid car parking for CBD commuters. I agree with the proponent that the proposed demolition of the BTC (West Tower) will reduce the car parking demand at Roma Street, with alternative commercial car parking available locally for CBD commuters.

The change application indicates that there will be temporary disruptions to busway operations during construction. These are likely to occur on the Inner Norther Busway adjacent to Roma Street Railway Station and the Eastern Busway adjacent to Boggo Road Railway Station and the Woolloongabba Busway Station. Temporary disruptions to the bus stops on Roma Street outside the existing railway station may also be impacted by construction activities. I agree with the proponent that these potential impacts can be managed to reduce impacts on busway operations by ensuring where possible they occur during off-peak periods.

Coordinator-General's conclusion

I am satisfied that the potential project changes to local traffic and busway operations have been identified and assessed. To manage the potential impacts on busway operations and in response to submissions, I have imposed a condition (Appendix 1) requiring the proponent to finalise and submit for my approval six months prior to commencement of project work an OEMP that includes possible mitigation measures such as:

- construction works within the busway corridor to be coordinated with entities controlling busway operations
- where busway shutdowns are required during operational hours, entities controlling busway operations will be consulted in advance to enable alternate routes and stops to be established
- temporary disruption to Inner Northern Busway adjacent to Roma Street and the Eastern Busway adjacent to Boggo Road Railway Station and Woolloongabba Busway Station will be managed in consultation with entities controlling busway operations and BCC
- early and on-going notification is to be provided to entities controlling busway operations, busway passengers and local communities of the timing and duration of shutdowns, likely disruptions to services and alternative arrangements to be implemented
- provision of temporary alternative bus stops to be provided in coordination with entities controlling busway operations where bus stops along Roma Street adjacent to the BTC (West Tower) are disrupted.

I note that submissions raised concerns with the impact of realigning the Myer Centre carpark exit ramp on Albert Street. I have therefore recommended that the proponent undertake an assessment of the potential impacts on surface pedestrian, traffic and public transport networks of the proposed change to the Myer Centre carpark exit in consultation with BCC and Myer Centre management.

Freight capacity

Currently rail operations in SEQ involve interdependencies and crossing movement between the passenger and freight sectors, which impacts and constrains the rail network capacity, as well as service reliability. Freight rail services use the Brisbane suburban network to access key freight destinations including the Port of Brisbane, Acacia Ridge freight terminal and the North Coast Line. Passenger services are prioritised over freight during peak periods, while the efficiency and performance of non-peak passenger rail operations are often affected by the need to schedule freight trains.

The change application outlines that rail freight demand forecasts for the changed project have been revised downward compared to the project and that freight demand can be accommodated within the existing rail network. Existing demand for freight through the Yeerongpilly section is approximately 50% of available capacity (train paths).

A number of submissions raised concerns with the loss of additional rail services in tunnels north of Yeerongpilly and additional surface tracks from Yeerongpilly south to Salisbury which is no longer included as part of the changed project. These additional surface tracks had the potential to provide track capacity for freight movements which are currently restricted to off-peak passenger service periods.

The submissions also raised concerns regarding the potential for negative impacts on freight movements associated with possession of the rail line during the construction of the project.

Coordinator-General's conclusion

I am satisfied that the potential impacts of the project changes on freight capacity have been identified and assessed. However, I acknowledge the concerns raised by submitters and recommend the proponent actively engage and consult with freight companies including the Western Freight Users Group regarding the possession of the rail corridor to reduce potential impacts on rail freight movements during construction.

5.4.2. Site-specific impacts and mitigation

Southern portal

The change application proposes to relocate the southern portal from Yeerongpilly to Dutton Park within the existing rail corridor between Railway Terrace and Kent Street.

Access to the southern portal worksite during construction will primarily be through the provision of a temporary bridge located adjacent to the rail overpass over the Eastern Busway. The bridge will be utilised by construction vehicles to access the worksite and will connect to Ipswich Road via O'Keefe Street, reducing the impact on the PA Hospital and Cornwall Street. A secondary access to the site will be via Cornwall Street onto Kent Street for light vehicles only.

Northern portal

The change application proposes to relocate the Northern portal from Victoria Park adjacent to the land bridge over the ICB to within the rail corridor adjacent to BGGS.

The construction worksite requirement within Victoria Park has been significantly reduced in the change application compared to the project. The worksite requirements are limited to land near the existing BCC temporary staging facility with some demolition of existing structures. To offset the reduced impact on Victoria Park, a car parking and construction laydown area on the opposite side of the ICB off Gilchrist Avenue is proposed and will result in an increase of 74 spaces, from 80 (project) to 154 (changed project).

Heavy vehicle movements to and from this worksite identified in the change application are forecast to peak at around five trucks per hour at peak spoil haulage times which is less than the peak haulage movements (eight per hour at peak spoil haulage) forecast for the project.

Boggo Road Railway Station

The change application proposes to relocate the previously proposed Boggo Road Railway Station from between the Boggo Road Gaol and the Ecosciences building to the east, between Joe Baker Street and the rail corridor as shown in Figure 5.2. The proposed location will allow for improved integration with the existing Park Road Railway Station and the Boggo Road Busway Station.

Figure 5.2 Proposed Boggo Road Railway Station[4]

The proposed change to the station location at Boggo Road also requires variations to the worksite locations and access points including a new general worksite and parking area located between Merton Road and Quarry Street, adjacent to the Park Road Railway Station.

Woolloongabba Railway Station

The change application proposes to relocate the Woolloongabba station 125m east of the original station location as shown in the Figure 5.3 below. The changed location will require demolition of the Landcentre, Goprint and the Dental Hospital, previously just the Goprint building was proposed to be demolished.

The Woolloongabba construction worksite will now support the operation of the TBMs driving north and mined tunnel construction advancing to the south. Access to the worksite has also changed slightly with access now available from Leopard Street.

The change application identifies that it is anticipated that there may be potential temporary impacts on busway operations to allow for construction of a pedestrian

[4] Source: Request for Project Change – Volume 1, February 2017

footbridge from Stanley Street at the western end of the Woolloongabba Busway Station.

These interruptions would be for short periods and would occur during off peak periods to minimise disruption to services. Workforce car parking requirements at Woolloongabba would increase from 72 spaces to approximately 300 for the changed project reflective of Woolloongabba being the main spoil extraction site.

Figure 5.3 Proposed Woolloongabba Railway Station[5]

Albert Street Railway Station

The changed project proposes to relocate Albert Street station one block to the north-west, closer to Alice Street compared with the original project (refer to Figure 5.4). Associated with the change in station location in Albert Street, sections of Albert Street between Mary Street and Elizabeth Street are proposed to be closed to vehicle traffic. This proposal would also require the relocation of the Myer Centre car park exit to Charlotte Street between Albert Street and George Street.

[5] Source: Request for Project Change – Volume 1, February 2017

Figure 5.4 Proposed Albert Street Railway Station[6]

Roma Street Railway Station

The change application includes a realignment of the tunnels between Turbot Street and Roma Street which results in a consequential change to the location of the underground Roma Street Railway Station. The change application proposes to locate the station 150m south-west from where it was proposed as part of the project. It is now proposed on the site of BTC (West Tower) as indicated on the Figure 5.5 below. The revised location of the Roma Street Railway Station location will require the demolition of the BTC (West Tower) including its car park comprising 600 spaces and relocation of the long distance coach terminal.

[6] Source: Request for Project Change – Volume 1, February 2017

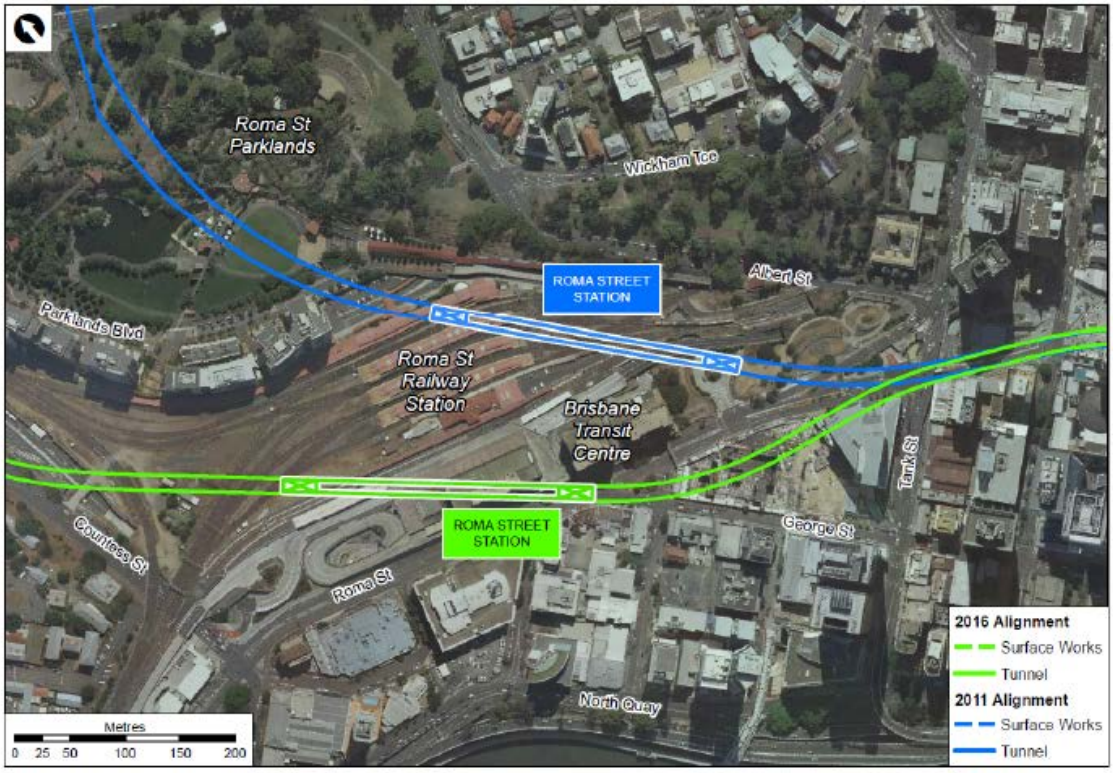

Figure 5.5 Proposed Roma Street Railway Station[7]

The change application also includes variations to the pedestrian access arrangements along Roma Street. The proposed conceptual layout (see Figure 5.6) includes the creation of a signalised T-intersection of George Street and Roma Street that will include a scramble pedestrian crossing. The T-intersection would be created through the re-alignment of George Street and Roma Street and the removal of the short section of Herschel Street between George Street and Roma Street.

[7] Source: Request for Project Change – Volume 1, February 2017

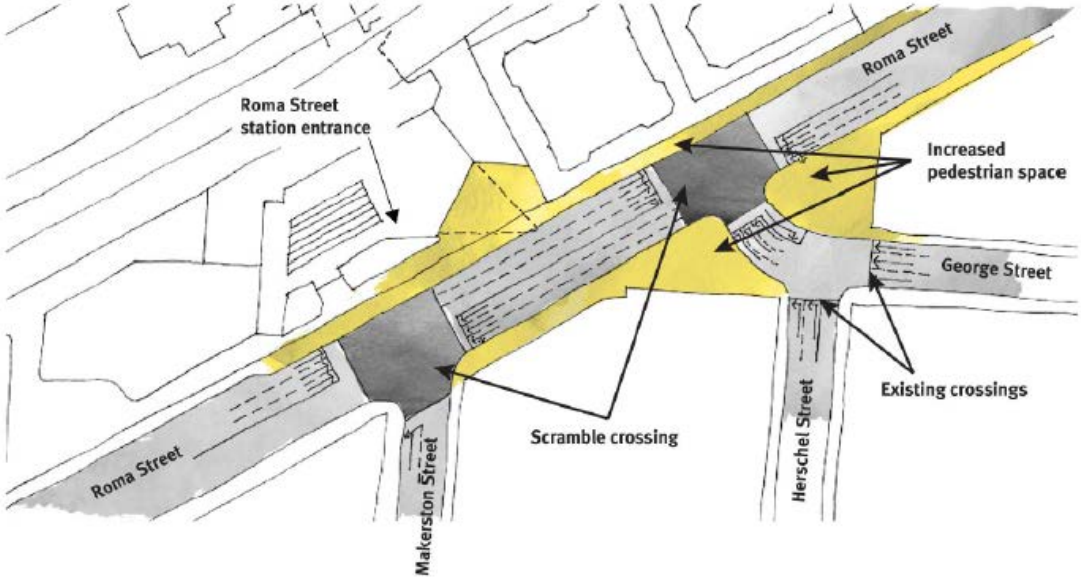

Figure 5.6 Proposed Roma Street intersection layout[8]

The change application includes variations to the construction worksites at Roma Street with the major worksite now proposed at the existing BTC (West Tower) with access directly from Roma Street; it was previously proposed to be located adjacent to platform 10 with access off Parkland Boulevard. Compared to the project, the changed project will require relocation of the inbound bus stop and CityCycle station on Roma Street and is also likely to result in disruptions to the Inner Northern Busway adjacent to Roma Street Station.

There are two access points from Roma Street to the changed major worksite, one in the west and one in the eastern section of the worksite. Some delays to pedestrian and cycle movements along Roma Street would arise due to vehicles crossing footpaths to access the worksite, however it is not anticipated that these delays would be worse than those of the project.

Exhibition Railway Station

The change application proposes to relocate the Exhibition Railway Station to the west and closer to Bowen Bridge Road compared to the project. The revised location of the station provides the same level of connectivity with the RNA showgrounds, Bowen Hills and the Royal Brisbane and Women's Hospital to those of the project.

The land required for construction worksites for the changed project reduces compared to that required for the project. The site on the corner of Sneyd Street and O'Connell Terrace identified for the project will no longer be required with areas for parking and storage to be provided within the existing RNA showgrounds and an area on the corner of O'Connell Terrace and Lanham Street. The changed project will not require the

[8] Source: Request for Project Change – Volume 1, February 2017

realignment and raising of O'Connell Terrace which was part of the project, which will reduce disruptions to traffic along O'Connell Terrace during construction.

Heavy vehicle movements to and from the Exhibition worksite are forecast to remain unchanged (between the changed project and the project) at approximately four trucks per hour at peak haulage times.

5.4.3. Coordinator-General's conclusion

The change application identified the potential traffic and transport impacts associated with the changed project. I require the proponent to develop mitigation measures through the CEMP to address and manage the potential traffic and transport impacts of the project. The OEMP must be submitted for my approval six months prior to commencement of construction

I acknowledge the concerns raised by multiple submitters regarding traffic and transport issues, particularly regarding the haulage of spoil, construction workers parking and potential impacts on pedestrian and cyclist movement during construction. Accordingly, I have imposed the following conditions:

- OEMP
  - this condition requires the proponent to finalise and submit for my approval six months prior to commencement of project work an OEMP including a range of sub plans to appropriately manage the traffic and transport impacts of the project. This OEMP must also be supported by a road safety assessment of the final spoil haulage route.
- Hours of work
  - this condition limits the spoil haulage and materials equipment delivery hours at all worksites except for the southern portal and Mayne Rail Yard which will reduce impacts on peak hour traffic movements.
- Traffic and Transport
  - this condition requires project construction traffic to be managed to avoid or minimise adverse impacts on road safety and traffic flow, public transport, freight rail movements, pedestrian and cyclist safety and property access.
- Traffic and Transport
  - this condition requires construction workforce car parking be provided and managed to avoid workforce parking on local streets.
- Traffic and Transport
  - this condition limits heavy construction vehicles to designated routes for spoil haulage and deliveries of major plant, equipment and materials in accordance with the OEMP.

I am satisfied the required management measures and imposed conditions will reduce traffic and transport impacts as much as practicable. I expect the potential traffic and transport impacts will be further reduced with the development of the applicable management plans to be prepared in consultation with key stakeholders.

5.5. Air quality

Dust and pollutant emissions during construction and operation of the changed project have the potential to impact the ambient air environment at sensitive receptors across the project.

The relocation of the Southern portal will avoid impacts at Yeerongpilly, but increase impacts at sensitive receptors surrounding the Southern portal/Boggo Road Railway Station. The application for project change predicts that, with mitigation, air emissions from construction will be well below the air quality goals for human health and nuisance.

Pollutant emissions during construction and operations are predicted to be similar to those previously assessed. Heat and in-tunnel emissions produced during operations will be released via ventilation systems at the locations of underground stations and through the tunnel portals.

The changed project will reduce Scope 1 and Scope 2 greenhouse gas (GHG) emissions by 34% during construction and 13-14 per cent during operation. The project change would reduce car dependency and associated vehicle emissions across the region.

5.5.1. Submissions received

Eleven submitters provided comments on the project change application relating to potential air quality impacts. Key issues included:

- potential for dust to cause health impacts associated with immune-compromised patients at the Leukaemia Foundation ESA Village and PA Hospital during construction
- potential for construction dust to impact on sensitive equipment, laboratories and research areas at the Ecosciences Precinct, Translational Research Institute (TRI) building, PA Hospital and Leukaemia Foundation ESA Village
- potential for construction dust to impact on residents, students and workers adjacent to the Southern portal and northern portal worksites including the BGGS
- location and impact of station ventilation outlets
- need for additional monitoring sites surrounding the Southern portal/Boggo Road Railway Station and Northern portal worksites.

After the submission period closed, Queensland Health (QH) was requested to clarify its submission and provide further information about the potential for health impacts at Southern portal/Boggo Road Railway Station. QH advised construction works at this location would have a high potential to cause air quality impacts on immune-suppressed patients at the PA Hospital and Leukaemia Foundation ESA Village. To reduce potential impacts, QH supported the requirement for air quality monitoring, adaptive management procedures and setting appropriate air quality goals at this location.

I have considered each submission and how the information provided by the proponent has responded to the submitter issues as part of my evaluation below.

5.5.2. Project-wide impacts and mitigations

Existing air quality (ambient air environment)

The ambient air environment of a locality, region or area establishes a baseline by which potential air quality impacts can be identified and assessed. The ambient air environment for the project was reassessed in the change application in light of updated air quality monitoring undertaken by DEHP.

The revised ambient air values for the changed project are presented in Table 5.3. Indicators and objectives presented in the table were derived from the EPP (Air) and nuisance limits previously conditioned as part of the project. The results indicated a slightly improved ambient air environment compared with the assessment undertaken for the project, which was based on data provided between 2004-2009.

Table 5.3 Ambient air environment[9]

Air quality indicator	Averaging period	Unit	Air quality objective	The Project[10]	Changed project[11]
Total suspended particulates (TSP)	24-Hours	$\mu g/m^3$	80	29	26
Total suspended particulates (TSP)	Annual	$\mu g/m^3$	90	28	24
PM_{10}	24-Hours	$\mu g/m^3$	50[12]	19	17
PM_{10}	Annual	$\mu g/m^3$	25	Not assessed[13]	14.5
$PM_{2.5}$	24-Hour	$\mu g/m^3$	25	Not assessed	8.3
$PM_{2.5}$	Annual	$\mu g/m^3$	8	Not assessed	6.5
Dust deposition	30-Days	$mg/m^2/day$	120	60	60

Potential impacts during construction

Dust emissions

Dust emissions generated from major construction activities have the potential to impact the ambient air environment and cause environmental nuisance at sensitive receptors. These include increased concentrations of:

- total suspended particulates (TSP)
- particulate matter 10 micrometers or less in diameter (PM_{10})
- particulate matter 2.5 micrometre or less in diameter ($PM_{2.5}$)
- deposited dust.

[9] Source: Request for Project Change – Volume 1, February 2017
[10] Based on 2004-2009 air quality data
[11] Based on 2014-2015 data
[12] 5 allowable exceedances per year
[13] Updated air quality indicators and objectives provided in EPP (Air) in 2016

Sensitive receptors identified within the project area predominantly include residential dwellings and commercial premises. Other community and special use sensitive receptors include, hospitals and related health services, stadiums, community halls, churches, parks and recreation areas.

During the project's approximately five year construction period, the following sources have the potential to emit dust and pollutants and impact air quality:

- worksite establishment and demolition activities
- tunnelling and associated excavation works (cut and cover operations)
- shaft excavation
- spoil removal and placement
- above ground road and bridge works
- construction of railway stations and other buildings
- wind erosion from disturbed locations
- wheel-generated dust from truck movements on unpaved surfaces
- power source emissions from construction equipment, generators and other plant.

To minimise nuisance from dust, odour and emissions occurring at nearby sensitive receptors, the CEMP will include mitigation measures for the changed project. With consideration to local meteorological conditions, this approach comprises predictive modelling, establishment of a construction dust monitoring program and adaptive management procedures.

The DOEMP provided indicative dust monitoring locations surrounding construction worksites to measure TSP and PM_{10} concentrations as well as dust deposition levels for the changed project. While I note that no monitoring is proposed for measuring $PM_{2.5}$ concentrations, the proponent has advised that $PM_{2.5}$ is more relevant to vehicle emissions rather than dust from construction and that any monitoring would likely detect $PM_{2.5}$ concentrations from other nearby sources, such as major roads.

To establish a suitable predictive modelling monitoring program for the changed project, the DOEMP identifies the requirement to establish and confirm baseline air quality data prior to construction. This will be achieved by utilising existing data where available and conducting additional baseline air quality monitoring prior to construction.

Examples of adaptive management practices that may be employed by the proponent during construction include:

- modification of construction methods such as installing work sheds fitted with fabric dust filters over deep excavation works and station shafts
- increasing dust suppression measures such as increasing water rates on exposed surfaces
- cessation of some or all construction work activities when no other reasonable or practical measure is available.

To ensure construction dust emissions are contained within the worksite boundaries, additional mitigation measures may include:

- managing dust-creating works according to meteorological conditions

- sealing of access roads and heavily trafficked areas within worksites
- water sprayers and covering loads of material transported from the worksites
- installing ventilated work sheds or enclosures over work areas
- actively managing spoil handling and stockpiles if loose material is present and exposed to wind
- installation of hoardings and barriers on worksite perimeters.

Should exceedances of air objectives at sensitive receptors be identified at any stage of construction, targeted consultation with Directly Affected Persons is proposed to occur. Such consultation may result in additional mitigations being applied through negotiation.

During the detailed design phase prior to construction, the proponent has committed to preparing and implementing an air quality management plan. The plan will be prepared in accordance with the DOEMP which seeks to minimise nuisance from dust, odour and emissions arising from construction activities at nearby sensitive receptors. The plan will provide additional information as to how this environmental outcome will be achieved for the duration of construction.

Pollutant emissions

The change project is not predicted to increase pollutants emitted during construction. Diesel and exhaust emissions would be the predominant pollutant contributors during construction generated from trucks and mobile site plant equipment such as generators.

As per the project, exposure to diesel and exhaust emissions during construction would be reduced by:

- managing the movement of construction vehicles to avoid queuing near sensitive receptors
- adopting procedures to avoid construction vehicles idling for excessive periods (longer than 5 minutes)
- ensuring all stationary plant and equipment with diesel motors are fitted with emission control measures and are regularly maintained to manufacturer's specifications.

Prior to the commencement of construction, a construction vehicle management plan will be developed. This plan will seek to reduce pollutants emissions ($PM_{2.5}$) generated by vehicles across the project site.

The change application identifies airborne contaminants and odours may be released from the inadvertent disturbance of contaminated material. This may occur should land be excavated that was previously used for dumping. As the excavation requirements for the construction of the tunnels have been reduced, there is a lower potential for inadvertent disturbance of contaminated material during construction. Further discussion regarding contaminated land is described in Section 5.2 (land).

To further reduce the potential for odours, the proponent will employ measures to avoid, mitigate and manage impact on adjacent properties. These measures include:

- ensuring clean cover material (clean fill) is available to immediately cover inadvertent disturbance of contaminated spoil
- undertaking potentially odorous works when favourable meteorological conditions are predicted to occur.

Potential impacts during operation

Potential air quality impacts during the operational phase of the changed project will generally remain unchanged from the project. Diesel locomotives and freight are not proposed to be conveyed through the tunnel and only minor emitting sources within the tunnel chambers would occur primarily from the trains breaking and clutch systems.

Operation of the changed project would require rail maintenance activities typically employed by Queensland Rail over the existing South East Queensland rail network. During maintenance works, emission sources may include machinery and related plant equipment required to replace track sections or rail grinding works to ensure the safe and efficient operations of the rail network.

During operations in-tunnel air emissions and heat will be discharged to the atmosphere via station ventilation systems and through the northern and southern portals. To reduce the risk of emissions impacting on sensitive receptors at these locations, the DOEMP outlines environmental design requirements which will be applied to the project.

The proposed environmental design requirements in the DOEMP, stipulate that ventilation systems will be designed and sited to ensure:

- an increase in air temperature of no more than one degree celsius when measured as an hourly average
- relevant air quality objectives are not exceeded
- air discharge into another air intake is avoided.

Immediately prior to operation, testing to verify the design performance of the ventilation systems will be undertaken during the commissioning phase. Where commissioning tests identify a potential for recurring exceedances of any relevant air quality objectives, it is proposed that systems would be refined, modified and subject to enhanced operating procedures to achieve the required environmental outcome.

Operation of the project would be integrated into the existing South-East Queensland's rail network managed by the Rail Infrastructure Manager. Accordingly, the revised project's operational requirements will be integrated with the Rail Infrastructure Manager's existing standards, guidelines, plans and programs to reduce the risk for air impacts over the operational phase of the project.

Greenhouse gas emissions

Revised Scope 1 and Scope 2 greenhouse gas (GHG) emissions were estimated for the construction and operational phases of the changed project. The changed project will achieve a 34 per cent reduction in Scope 1 and Scope 2 greenhouse gas (GHG) emissions during construction and 13-14 per cent during operations.

The GHG emissions produced by the changed project during construction would be approximately 433,781 tonnes carbon dioxide equivalent (tCO_2-e).The primary sources of GHG emissions during construction included electricity consumption (265,934 tCO_2-e) and diesel fuel consumption (167,847 tCO_2-e).

Operational GHG emissions from the changed project are predicted to be 13-14 per cent lower than the project. This is due to a reduction in the GHG emission factor for electricity consumption in Queensland by 13 per cent. Accordingly, GHG emissions for the changed project are now predicted to be 124,606 tCO_2-e by year 2036.

Operation of the project would result in the reduction of 1.8 million vehicle kilometres travelled per day by 2036. This would ultimately reduce Scope 3 GHG emissions across the greater Brisbane region.

Opportunities to further reduce greenhouse emissions over the life of the project include:

- reducing energy demand by employing energy efficient layout and design
- reducing energy demand by designing energy efficient mechanical and electrical systems and technologies
- implementing asset management strategies that encourage efficient use of energy.

The *National Greenhouse and Energy Reporting Act 2007* (NGER Act) establishes the national framework by which Scope 1 and Scope 2 greenhouse gas emissions, energy production and energy consumption must be reported. Under the NGER Act, controlling corporations must report Scope 1 and Scope 2 GHG emissions when relevant facility thresholds or corporate group thresholds are exceeded.

To allow GHG emissions to be accurately calculated and reported for the construction phase of the project, the following consumption data will be recorded:

- diesel, petrol, liquefied petroleum gas (LPG) used by project and contractor vehicles and machinery
- electricity used by the project and contractors working on site
- consumption of oils and greases
- number and size of any refrigeration units on site.

Once the project is constructed, it is envisioned that Queensland Rail as the rail operator would incorporate the project into existing management procedures, including the requirement to report Scope 1 and Scope 2 GHG emissions in accordance with the NGER Act.

5.5.3. Site-specific impacts and mitigation

Construction worksites

Dust emissions generated at construction worksites have the highest potential to cause environmental nuisance and adverse health impacts to nearby sensitive receptors. These construction worksites include:

- southern portal/Boggo Road Railway Station
- Woolloongabba Railway Station

- Albert Street Railway Station
- Roma Street Railway Station
- Exhibition Railway Station
- northern portal
- Mayne Rail Yard.

Predictive air dispersion modelling

To predict the potential for air quality impacts during construction, the proponent undertook predictive air dispersion modelling. Based on the California Puff Model (CALPUFF) methodology, modelling predicted TSP, PM_{10}, $PM_{2.5}$ and dust deposition concentrations at sensitive receptors surrounding project worksites. The results for each worksite are provided below.

Southern portal/Boggo Road Station

At the southern portal/Boggo Road Railway Station, cut and cover works are proposed to occur which would potentially emit large levels of dust emissions beyond worksite boundaries. Sensitive receptors in this location notably include the PA Hospital, Leukaemia Foundation ESA Village, Ecosciences Precinct and the TRI building.

At this location, cumulative impacts from the southern portal and Boggo Road worksites pose a high risk to public health given their close proximity to nearby hospital and health related facilities. QH has identified that immune-supressed patients and those experiencing respiratory-related illnesses would be most at risk due to their susceptibility to airborne contaminants. Any increased exposure to PM_{10}, $PM_{2.5}$ or TSP concentrations for such patients could cause irritation and worsening of existing health conditions.

CALPUFF dispersion modelling at the southern portal/Boggo Road Railway Station worksites accounted for the provision of a dust enclosure equipped with fabric filters to contain dust emissions. With this mitigation provided, modelling predicted impacts to the ambient air environment would be within the acceptable EPP (Air) objectives for human-health and environmental nuisance. However, early construction and excavation works undertaken prior to the installation of such dust enclosures may result in impacts greater than those predicted in the air dispersion methodology.

The DOEMP provides indicative dust monitoring locations at all worksite locations of the change project. At the southern portal/Boggo Road Railway Station, monitoring locations are only provided to the Southern side of the worksites. Two submitters requested additional monitoring locations should be provided to the north of the construction worksites to be representative of the various residential and commercial uses in that area. In response to submitter concerns, I have recommended that the proponent include monitoring locations to the north, south, east and west of the Southern portal/Boggo Road Railway Station worksites given the unique sensitivities of nearby sensitive receptors. In relation to monitoring locations generally across the project, the proponent advised they would consider additional monitoring locations during the detailed design phase.

Woolloongabba Station

The Woolloongabba worksite would be used as the primary spoil removal location during construction. Accordingly, dust impacts at Woolloongabba Railway Station have the highest potential to generate nuisance levels of dust emissions on the nearby sensitive receptors.

The predictive air dispersion modelling undertaken for the Woolloongabba Railway Station identified that the dust deposition objective of 80 µg/m^3 over 30 days, would be exceeded at three nearby sensitive receptors. Exceedance of the deposited dust air objective (120 µg/m^3 over 30 days) was also predicted to occur at six sensitive receptors. At the Gabba stadium, a dust deposition rate of approximately 70mg/m^2/day is predicted to occur. This is approximately 10 mg/m^2/day higher than the ambient air quality level observed at this location.

At the Woolloongabba worksite, one of the impacted sensitive receptors (a commercial purpose building on Main Street) was predicted to incur the greatest dust impacts during construction. At this location, five of the seven air quality objectives were modelled to be exceeded. This building is now proposed to be acquired and demolished as part of the changed project and removed as a sensitive receptor.

Albert Street/Roma Street and Exhibition Stations

Predictive modelling was not undertaken for the Albert Street Railway Station, Roma Street Railway Station or the Exhibition Railway Station. As per the project, dust concentrations emitted in these locations are not expected to be significant as the proponent has committed to installing purpose-built dust enclosures and/or acoustic sheds at these worksites. Similarly to southern portal/Boggo Road Railway Station worksites, air quality impacts may occur during pre-construction earthworks prior to the installation of the dust enclosures fitted with fabric filters.

Northern portal

The EPP (Air) objectives are not predicted to be exceeded at any sensitive receptor at the northern portal. The changed project has reduced the construction footprint and provided additional mitigations outlined in the DOEMP for this location. A small quantity of spoil is expected to be hauled from this location, increasing the potential for wheel-generated dust to occur. To reduce this risk, haul roads and site access points are proposed to be paved.

Although the changed project is expected to reduce dust impacts at this location, submitters highlighted that nuisance-based dust deposition levels may be experienced along the northern site boundary of BGGS. Submitters also proposed additional monitoring locations should be provided at this location. In their response to submissions, the proponent has committed to consult with Directly Affected Persons and consider including additional monitoring locations during the detailed design phase.

Mayne Rail Yard

Changes to track configurations at the Mayne Rail Yard require the construction of an underpass at this location. This will require the removal of approximately 3,600m^3 of

material resulting in an increased potential to cause dust nuisance at this location. Accordingly, predictive air dispersion modelling identified exceedance of the 30 day dust deposition rate would occur at two sensitive receptors. To reduce the potential for impacts at this location, I expect the proponent to employ adaptive management measures outlined in the DOEMP to avoid, mitigate and manage air emissions accordingly. . In instances when impacts cannot be avoided, I require the proponent to consult with Directly Affected Persons in advance of construction works and determine appropriate mitigations to be applied at the locations of sensitive receptors.

5.5.4. Coordinator-General's conclusion

I am satisfied with the proponent's commitment to minimise nuisance dust, odours and emissions from construction of the changed project. I note the proponent's adaptive management approach which includes meteorological forecasting, predictive modelling, air quality monitoring and adaptive management procedures.

For air quality impacts generally across the project, I have imposed a condition (Appendix 1) requiring the proponent to achieve relevant air quality goals. The goals are generally in accordance with the EPP (Air) human health and nuisance objectives recommended by DEHP for the project.

Prior to construction, I require the proponent to prepare and implement an air quality management plan as part of an approved OEMP. Mitigation measures in that plan may include:

- methodologies proposed to forecast meteorological conditions
- methodologies proposed to model exceedances at sensitive receptors nearby construction worksites - including an alert system notifying of potential exceedances
- methodologies proposed for monitoring TSP and PM_{10} concentrations at each construction worksite - including the workings of an alert system to notify of exceedances
- revised air quality monitoring locations across the project - including to the north, south, east and west of construction worksites
- details of an adaptive management protocol that will be implemented to avoid, mitigate and manage the generation of airborne contaminants at worksites during and outside of work hours
- outcomes of any revised air dispersion modelling for construction worksites including for those not previously modelled (Albert Street, Roma Street and Exhibition Stations)
- outcomes of consultation conducted with Directly Affected Persons adjacent to construction worksites—including any additional site specific mitigations required to minimise additional dust impacts raised.

I note the changed project avoids air quality impacts at Yeerongpilly, however I acknowledge the concerns raised by various submitters particularly in regard to impacts on immune supressed patients at the PA Hospital and Leukaemia Foundation ESA Village.

Acknowledging these concerns and advice received from QH, I recommend that the proponent further consider site specific air quality mitigations at the Southern portal/Boggo Road Railway Station worksite including the establishment of real-time monitoring.

I support the proponents key mitigation measure of installing dust enclosures fitted with fabric filters at the Southern portal/Boggo Road Railway Station worksites. However, to ensure dust impacts are managed prior to the installation of dust enclosures at this location, I have recommended that the proponent undertake predictive modelling at this location for early construction earthworks. Should exceedance of the relevant air quality objectives be identified, I recommend the proponent directly consult with relevant entities including representatives of the PA Hospital, Leukaemia Foundation ESA Village, Ecosciences building and the TRI building.

During operations, the potential for air quality impacts would be air emissions and heat discharged from the tunnel through the tunnels portals and ventilation outlets at the locations of underground railway stations. I am satisfied with the proponents Environmental Design Requirements and conditioned at Schedule 1 that ventilation systems will be sited to avoid discharge to other air-intakes and exceedance of relevant air quality objectives.

I acknowledge that the Rail Infrastructure Manager is proposed to integrate the project into the existing operating standards, practices and procedures currently employed on the South East Queensland rail network. Accordingly, the Rail Infrastructure Manager would be responsible for managing and maintaining in-tunnel air quality and maintain the tunnel ventilation systems during the projects operation phase.

I am satisfied the change application adequately predicted Scope 1 and Scope 2 GHG emissions over the life of the change project. I note the proponent is aware of the legislative requirements of the NGER Act to report on GHG emissions and would further implement measures to reduce GHG emissions over the life of the project.

5.6. Visual amenity and lighting

During construction and operation of the changed project, there will be changes to the visual amenity and lighting when compared to the original project.

Key changes include:

- reduced visual amenity and lighting impacts as a result of the reduction in the length of the project and the project alignment
- increased impacts on visual amenity at Roma Street Railway Station during the demolition phase, due to the demolition of the BTC (West Tower)
- reduced visual and amenity impacts at Victoria Park as a result of the relocation of the northern portal within the existing rail corridor
- reduced visual impact at Mayne Rail Yard due to the removal of the proposed viaduct structure.

5.6.1. Submissions received

Eleven submitters raised visual amenity and lighting as an issue. Two were from organisations, five were private submitters, and four were from state and local government agencies. Key issues raised in submissions included:

- impacts on the visual amenity at all station locations during construction
- demolition of properties on Albert Street which will impact on street amenity
- impact on heritage places, particularly at the City Botanic Gardens and Hardgrave Park
- lighting impacts on and around Albert Street.

I have considered each submission and how the information provided by the proponent has responded to the submitter issues as part of my evaluation below.

5.6.2. Project-wide impacts and mitigation

Lighting

I note that some submitters raised concerns regarding lighting impacts on residential dwellings. During construction, night lighting will be required for safety and security of the workforce personnel and property, and will also be required in order for personnel to undertake night-time work. In accordance with the project, night lighting will be most prominent at the worksites associated with the underground stations.

Although the majority of night-time works will occur underground or within the confines of acoustic sheds, some works may require external lighting.

I am requiring the proponent, through the OEMP to ensure construction lighting is in accordance with the stand Australia Standard AS 4282-1997: Control of the obtrusive effects of outdoor lighting and that construction activities minimise and mitigate impacts on the visual and landscape environment.

Consistent with the project, lighting will be provided to improve amenity and safety and will be consistent with the urban environment of the project work sites.

Operational lighting along the track alignment will be minimal and in accordance with current Queensland Rail lighting requirements and due to these requirements, it is improbable that there will be lighting impacts on sensitive receptors.

Operational lighting at the stations will be in accordance with the *Disability Discrimination Act 1992* and Queensland Rail standards. Accordingly, lighting will be required to illuminate the platform, mezzanine, concourse and entrance areas to ensure safe and reasonable access to the stations. Lighting will also be used as a deterrent to crime.

Management and mitigation measures

The mitigation measures for lighting are not changed due to the proposed changed project. The proponent is required, through the implementation of the OEMP, to ensure all lighting impacts are managed in accordance with relevant standards, including AS4282-1997: *Control of the obtrusive effects of outdoor lighting and Queensland Rail's Lighting Standard for Railway Stations guidelines.*

I consider the operational impacts from lighting generated by the changed project to be similar or consistent with those expected for the project.

Coordinator-General's conclusion

I am satisfied that the impacts from construction and operation lighting are generally consistent with the project and will be appropriately managed through the OEMP and CEMP and Rail Infrastructure Manager's requirements.

5.6.3. Site-specific impacts and mitigation

Consistent with the project, residential areas and places of community importance, such as parks, recreational areas and heritage sites would be sensitive to changes to the visual environment.

During construction, temporary, short-term impacts on landscape character and visual amenity are expected at locations near the construction worksites, including:

- acoustic sheds
- security fencing
- site offices
- night lighting.

The proponent has undertaken a comparative visual assessment with the project which identified associated impacts to the landscape and physical environment.

I am requiring the proponent, through the OEMP to prepare a Visual Impact Mitigation plan which will mitigate potential visual impacts during construction and include the use of noise barriers and hoardings. Impacts on the visual amenity and landscape of each proposed station is detailed below.

Southern portal

A construction worksite is proposed to be located at Dutton Park Railway Station for the southern portal and will extend to the south-east of the rail alignment along Kent Street with space for light vehicle parking, work sheds, laydown areas and offices. The impact of this worksite on the visual amenity and the landscape is generally consistent with the project and would be a short-term impact until the changed project is operational.

Boggo Road Railway Station

The changed project is considered to have a beneficial impact at the revised location of the Boggo Road Railway Station, including reduced impacts to the Ecosciences building and the Boggo Road Gaol. During construction, a site compound will be located along the southern extent of Joe Baker Street and will accommodate offices, water treatment sites and noise barriers. The existing elevated panoramic view of Boggo Road Railway Station will be temporarily restricted. These impacts are consistent with the project.

The detailed design for the changed project will consider the creation of positive visual attributes for the area.

Woolloongabba Railway Station

The construction worksite at Woolloongabba Railway Station is planned to be larger than that proposed by the project and will accommodate offices, car parking, water treatment, a substation, workshop, acoustic shed, as well as storage areas for spoil and the TBM. I agree with the proponent's analysis regarding the changes to this worksite, being the impact on visual amenity is minor due to the previous site being allocated for construction works in the project.

There will be a change in the visual amenity at the Woolloongabba Railway Station as the buildings that are proposed to be demolished have increased from the project to include the Dental Hospital in addition to the Landcentre and Goprint buildings which is consistent with the project.

The Woolloongabba Railway Station will be designed to take advantage of the opportunities arising from the existing busway station and will support urban development in the area. Overall this station is expected to have a positive impact on the visual amenity and landscape due to the architectural design of the station and the removal of unappealing infrastructure.

Albert Street Railway Station

Albert Street Railway Station is proposed to be relocated one block to the north as a result of the changed project. The relocation of this station requires the demolition of properties located north of the intersection of Mary Street on either side of Albert Street which will impact the visual amenity and landscape of the area. These impacts are considered to be consistent with the project, which was proposing to locate the station closer to the Botanic Gardens in Albert Street.

Additionally, the change application proposes to close parts of Albert Street to vehicle traffic, which is in accordance with the vision of the BCC Master Plan – Albert Street Vision, and to provide vertical transport between the station and the street. The closure of Albert Street to vehicle traffic is considered a positive contribution to the visual amenity and landscape of the CBD due to the improvement of the streetscape and additional public spaces.

Roma Street Railway Station

The demolition of the BTC (West Tower) at Roma Street Railway Station would impact on the visual amenity and the landscape of the area. According to the change application, this impact will be a temporary benefit to the area, opening up sightlines along George Street to St Brigid's Church, Red Hill. This may only be a temporary benefit due to any redevelopment that may occur on the site under the BCC planning scheme.

Northern portal

At Victoria Park, there will be considerably few impacts to the visual amenity and landscape as the alignment and northern portal is now located within the existing rail corridor. However, I am requiring the proponent to ensure that project works and worksites and Victoria Park are designed, and planned to avoid or minimise the loss of vegetation, in accordance with the DOEMP.

Exhibition Railway Station

The project required the raising of O'Connell Terrace Bridge at Exhibition Railway Station. This is no longer required as a result of the changed project, which will reduce the overall visual impact at this location, including fewer disturbances to vegetation and a smaller worksite.

The construction of this station will be enclosed by boundary hoarding which will reduce the views of the construction. During operation, the change application concludes that this station will have a similar impact on the visual amenity of the existing station precinct.

Mayne Rail Yard

Mayne Rail Yard will have a reduced impact on the landscape as a result of the changed project as the viaduct structure is no longer required. The reduction in the alignment and removal of proposed infrastructure from Salisbury to Yeerongpilly Railway Station has removed any potential impact on visual amenity and the landscape in these locations during construction and operation

Management and mitigation measures

The proponent is proposing through the DOEMP to mitigate visual amenity of construction worksites by:

- preparing a Visual Impact Mitigation Plan prior to construction to mitigate potential visual impacts of noise barriers and hoardings, where appropriate
- designing and operating worksites to minimise the loss of public open space
- ensuring that the design and siting of construction worksites considers topography, vegetation, scale, character of construction and construction materials, proximity to surrounding sensitive land uses and the duration of its use
- providing noise barriers and hoardings around construction worksites to mitigate the views of construction works and where appropriate, these will incorporate landscaping and urban design measures to minimise the visual impact of the barriers and will be regularly maintained
- minimising external night-time construction activities and traffic movement within the worksites, where possible.

I expect the proponent to prepare and implement a Visual Impact Mitigation Plan prior to construction, as outlined in the DOEMP.

Coordinator-General's conclusion

I am satisfied that construction and operation impacts on visual amenity and landscape are generally consistent with the project and that the DOEMP contains appropriate provisions to identify and mitigate the impacts from construction and operation on visual amenity and the landscape, including the implementation of a Visual Impact Mitigation Plan. I require, through imposed conditions (Appendix 1) the proponent to submit for my approval the OEMP, and that this adequately manages impacts to visual amenity and the landscape.

5.6.4. Coordinator-General's conclusion

Although the locations of potential impacts have changed, the visual amenity and landscape impacts resulting from the changed project are generally consistent with the impacts for the project. Overall, the stations will be designed to minimise the visual impact of the above-ground infrastructure and will incorporate landscaping, urban design and public art treatments sympathetic to heritage landscape and streetscape values.

As with the project, the changed project will result in an overall positive visual amenity and lighting outcome due to the development of new stations which will enhance public and civic spaces and increase the security around these stations.

I am satisfied that the assessment has identified the visual amenity and lighting impacts for the changed project and developed measures which appropriately manages and mitigates these impacts.

In addition, I am requiring the proponent, through an imposed condition (Appendix 1) to ensure that project works will be designed to minimise impacts on the landscape and ensure impacts at Victoria Park will be adequately managed. In addition, I am requiring the proponent to submit to me for approval, the OEMP, which will outline the environmental outcomes, performance criteria and proposed mitigation measures to manage visual amenity and lighting impacts resulting from the changed project.

5.7. Cultural heritage

The changed project has the potential to impact cultural heritage through:

- disturbance, damage or destruction of Indigenous cultural heritage sites or places
- potential impact on the visual setting of a heritage place due to the introduction of an inconsistent (new) built form
- potential adverse impact on the physical fabric of a known heritage place, as a result of vibration and/or settlement caused by construction works.

5.7.1. Submissions received

Eight submitters raised cultural heritage issues. One was from an organisation, four were private submitters and three were from state and local agencies. The key issues raised include:

- impacts to existing heritage facades, buildings, facilities and vegetation within the zone of works
- potential vibration impacts to BGGS
- community consultation in the development of mitigation measures
- heritage condition surveys prior to commencing construction work
- heritage conservation management plans and archival recording procedures developed in accordance with DEHP guidelines
- archaeological discovery provisions under the QH Act
- identification of all potential impacts for registered heritage places or structures along the proposed alignment.

I have considered each submission and how the information provided by the proponent has responded to the submitter issues as part of my evaluation below.

5.7.2. Project-wide impacts and mitigation

Indigenous cultural heritage

The change application identified potential Indigenous cultural heritage impacts through a search of the DATSIP Aboriginal cultural heritage database and register in 2016. The search revealed that no new Indigenous cultural heritage sites or places had been recorded on the register within the study corridor since the assessment of the project. Furthermore, a native title claim over the study corridor was dismissed in 2015.

The impacts of the changed project on Indigenous cultural heritage would be reduced compared to the project, due to the relocation of the northern portal to within the existing rail corridor. This avoids the previously identified impacts to Victoria Park, including the culturally significant York's Hollow.

Management and mitigation measures

The proponent has committed to consulting with the cultural heritage parties of the area, represented by the Jagera Daran Pty Ltd. and Turrbal Association Inc. The cultural heritage parties would also be contacted to inform them of the proposed

changes to the project, and to seek their advice in relation to Indigenous cultural heritage management within the study area.

In accordance with the ACH Act, a CHMP would be negotiated between the cultural heritage parties for the area and the project proponent. Mitigation measures would be reviewed and agreed to through the CHMP, and may be consistent with those previously identified in the EIS. The proponent would ensure that all reasonable and practicable measures will be taken to avoid harm to Indigenous cultural heritage.

Non-Indigenous cultural heritage

For the assessment of non-Indigenous cultural heritage, the change application undertook a synthesis of previous studies, which included the cultural heritage report, compiled for the Cross River Rail project EIS and the Bus and Train project EIS. Impacts at specific sites are discussed below.

5.7.3. Site-specific impacts and mitigation

Southern portal and Boggo Road Railway Station

The change application predicted that the construction of the changed project would not impact the cultural heritage values of the Queensland Heritage Register (QH) listed Boggo Road Gaol, due to the increased separation distance of over 100 m between the gaol and the proposed project works.

However, there is the potential for adverse visual heritage impacts to the Boggo Road Gaol due to the inconsistent structural and design form of the new station with the surrounding historical features, although this impact is expected to be reduced compared to the project.

Boggo Road Railway Station to Woolloongabba Railway Station

The change application predicted that the change in tunnelling methodology from bored to mined tunnelling between Boggo Road and Woolloongabba Railway Stations would reduce the previously identified vibration impacts at Boggo Road Railway Station. Additionally, the changed project would move the tunnel further away from a number of identified heritage places, namely local heritage-listed The Chalk Hotel and St Seraphim Russian Orthodox Church at Woolloongabba.

Building damage due to settlement to the north of Boggo Road Railway Station would be ‘negligible’.

At the Woolloongabba Railway Station worksite, no additional heritage impacts due to settlement are expected. The change application concluded that the potential for adverse heritage impacts at the Woolloongabba Railway Station worksite are expected to be nil to low.

Woolloongabba Railway Station to Albert Street Railway Station

To the south of the Brisbane River, the change application predicted that potential heritage impacts would be consistent with those previously identified.

The changed alignment would be closer to the QH listed St Nicholas Russian Orthodox Cathedral and local heritage-listed properties 32 Mark Lane, 23 Walmsley Street and 56 Llewelyn Street of Kangaroo Point, while further from the St Joseph's College complex at Spring Hill.

The change application concluded that careful construction management would be required to reduce the potential of settlement and vibration impacts for the St Nicholas Russian Orthodox Cathedral. The non-Indigenous Cultural Heritage Management plan, supported by vibration and settlement monitoring, would provide further assistance in managing potential risk.

To the north of the Brisbane River, the proposed Albert Street Railway Station would be located further north between Mary and Elizabeth Streets, removing the previously proposed Alice Street entrance and the associated impacts to the QH listed Brisbane Botanical Gardens fence and fig trees.

Albert Street Railway Station to Roma Street Railway Station

The change application predicted the settlement impacts at Albert Street Railway Station would be consistent with the project. The assessment identified that Albert Street to Charlotte Street to King George Square is mapped as having no archaeological potential; therefore archaeological finds during construction are unlikely.

The excavation of the Albert Street Railway Station structures and the construction of the southbound bored tunnel could affect the QR listed Royal Albert Apartments building via settlement and vibration. However, investigations suggest that the findings that the separation distance between the station cavern and the Royal Albert Apartments building is adequate to manage any potential impacts.

The change application concluded that the proposal to close parts of Albert Street to vehicle traffic has the potential to enhance the streetscape and facilitate better appreciation of the historic facades.

It is noted that a submitter raised concern with the demolition impact to the CEY Building façade along Albert and Mary streets. Advice from the proponent subsequent to the public notification of the change application identifies that the CEY Building and façade is not currently heritage listed.

Between Albert Street Railway Station and Roma Street Railway Station, indicative maximum vibration levels and settlement impacts would be consistent with the project. Consistent with the project, the changed project tunnels would pass under a number of areas identified as having outstanding archaeological potential. However, the impacts would be experienced at new places and structures than previously identified from the corner of Roma Street and Ann Street northwards. These places would include:

- McDonnell and East & Co Building (QH listed)
- Transcontinental Hotel (QH listed)
- former Bank of Queensland (local heritage)
- the former baby clinic at 51 Herschel Street (local heritage)
- the city block of historic buildings bounded by George, Turbot, Roma and Ann Streets (local heritage).

Monitoring settlement during construction would further manage potential heritage risks in this area.

Roma Street Railway Station to Exhibition Railway Station

The changed project would locate the proposed Roma Street Railway Station underneath the existing BTC, requiring demolition of the BTC (West Tower) and coach ramps. This station would be located further from the existing QH listed Roma Street Railway Station and associated infrastructure.

The assessment predicted that the heritage impacts at Roma Street Railway Station would be consistent with the project, where impacts are expected to be nil to low due to the distance of the proposed construction works from the listed heritage places and structures.

The proponent advised that detailed construction management strategies would be developed and captured non-Indigenous cultural heritage management plans. The plans would identify the places of state or local historical heritage significance likely to be impacted by works, and detail mitigation measures in accordance with the project's OEMP.

Between Roma Street Railway Station and Exhibition Railway Station, the changed project alignment would be within close proximity to:

- Commonwealth and local heritage-listed Victoria Barracks on Petrie Terrace
- QH listed BGS
- local heritage-listed BGGS.

All cut-and-cover structures would be located within the rail corridor, eliminating previously identified construction impacts to Victoria Park. Indicative maximum vibration levels are expected to be similar to what was previously predicted for identified buildings within the immediate surrounds. New heritage impacts due to settlement may arise for places on Petrie Terrace, Countess Street and Kelvin Grove Road due to the changed alignment, impacting receivers that would previously have not experienced impacts for the project.

Ground-borne vibration near the Commonwealth heritage-listed Victoria Barracks at Petrie Terrace would be in the range of 0.1 to 0.3 mm/sec peak particle velocity (PPV), well below the criterion for heritage places of 2.0 mm/sec PPV. Settlement due to TBM passby is unlikely to impact on the fabric of any building within the Victoria Barracks. The change application identified that prudent construction management would be required to manage the risk, and would involve predictive and real-time modelling of both vibration and settlement.

The proposed alignment would be further from BGS and be unlikely to result in heritage impacts; however, settlement at BGS is predicted to range between 25–30 mm over a trough of 50–70 m. An increase in vibration of 0.2 mm/s is predicted near BGGS due to the change in alignment; however any impact from vibration at BGGS is predicted to remain compliant with the human comfort for educational facilities goal, outlined in the DOEMP. Monitoring will be required to mitigate the risk of damage to heritage buildings.

The change application concluded that construction impacts at Exhibition Railway Station would be similar to those previously identified for the project. However, impacts to the mature fig trees adjacent to the Number 2 Ring and the existing Exhibition Railway Station would be reduced.

Management and mitigation measures

For the majority of the work sites identified, mitigation measures for the changed project remain consistent with those that were identified for the project.

New mitigation measures identified by the proponent in the DOEMP are directed at ensuring settlement monitoring is undertaken at newly impacted heritage places in the vicinity of the changed alignment.

Rock breaking ground-borne noise and vibration trials would also be undertaken to accurately determine the extent of the potential impacts. These trials would inform the need for drill and blast construction of station shafts, where required to reduce potential cultural heritage impacts. The need for avoidance of damage to mature trees and established vegetation has also been identified.

5.7.4. Coordinator-General's conclusion

Indigenous cultural heritage

I am satisfied that the proponent has adequately assessed the changed project's impacts to Indigenous cultural heritage. The change in the project's alignment would avoid any impacts to the significant York's Hollow area within Victoria Park, and I consider this a beneficial outcome.

I consider the proponent's commitment and legislative requirements under the ACH Act to develop a CHMP with the cultural parties of the area adequate to ensure any adverse impacts to Indigenous cultural heritage would be appropriately identified and managed.

I have imposed a condition (Appendix 1) requiring the proponent to develop an Indigenous Cultural Heritage Management plan, as part of the DOEMP. I expect that the Indigenous cultural heritage mitigation and management measures outlined in the project's DOEMP would be fully implemented through the management plan including:

- consideration of opportunities for Aboriginal people to be involved in the construction and development if the project, including opportunities for traineeships and employment on the project
- consideration of planting native vegetation, including food plants, as part of the revegetation strategy for the project
- maintenance of gardens and lawns around the stations to sustain native vegetation
- consideration of the use of properties acquired for the project to provide services and affordable housing for Aboriginal people
- consideration of the return of remnant land acquired for the project to Indigenous parties.

This should be undertaken through on-going consultation with the Jagera Daran and Turrbal People. Opportunities for acknowledgement of a locality's significance to Aboriginal people should also be detailed within the management plan.

I have also imposed a condition (Appendix 1) to ensure the project is designed to achieve the Indigenous cultural heritage environmental design requirements provided in schedule 1.

Non-Indigenous cultural heritage

I am satisfied that the assessment has identified the changes to the potential non-Indigenous cultural heritage impacts. I note that there is likely to be a reduced impact on Victoria Park, and I consider this among the positive cultural heritage outcomes resulting from the changes to the project.

I have imposed a condition (Appendix 1) requiring that the proponent must achieve the non-Indigenous cultural heritage Environmental Design Requirements in Schedule 1 of the imposed conditions. The imposed conditions required the proponent to provide written notice to me that the changed project has achieved the Environmental Design Requires as the completion of commissioning.

I have imposed a condition requiring the proponent to develop cultural heritage management plan that details mitigation and management measures to address identified impacts, including:

- the preparation of a Heritage Management plan for places of cultural heritage value likely to be impacted by works, prior to these works commencing
- building condition surveys of each building of Commonwealth or State heritage significance, prior to and upon the completion of the works where predictive modelling indicates ground-borne vibration or settlement would present a risk
- a process for vibration and settlement monitoring at historical places identified in a heritage management plan as being at risk of damage during construction, in accordance with the approved management plan
- the preparation of an archaeological management plan for protection of archaeological sites prior to and during construction
- measures to undertake archival recording of cultural heritage values, where harm to historical heritage values cannot be reasonable or practically avoided
- conducting archaeological test pitting in places of high to outstanding archaeological potential, prior to construction activities involving surface ground disturbance commencing, including parts of Albert Street and Charlotte Street
- undertaking construction works in accordance with the measures outlined in the air quality, noise and vibration and geology and soils sections of the OEMP, to protect heritage values from excessive noise, dust and settlement.

I note that BGGS requested the proponent further consider and clarify impacts to the school as result of the changed project. Similarly, submitters requested consultation from the proponent regarding the impacts and mitigation and management of potential impacts at Exhibition Railway Station. In recognition of these concerns, I have imposed a condition (Appendix 1) requiring the proponent to consult with Directly Affected Persons prior to commencement of project works and ongoing thereafter about project

works, predicted impacts and mitigation measures as part of the Community and Stakeholder Engagement plan. Those consulted should include, as a minimum, those identified in the DOEMP likely to be experience cultural heritage impacts due to settlement and vibration.

I note that the Queensland Heritage Council (QHC), in its submission, raised an issue about the identification of registered heritage places or structures along the proposed alignment. I acknowledge this concern; however, I am satisfied that the change application has adequately identified all heritage places and structures along the proposed alignment that may be impacted by the construction of the project. Further, I am satisfied that the non-Indigenous Cultural Heritage Management plan would ensure potential heritage impacts to surrounding buildings are mitigated and managed appropriately.

I acknowledge the comments of submitters regarding the analysis of potential heritage impacts, given the historical values present across the project corridor. In the CGER conclusion, I noted that DNRM advised that due to the proposed depth of the tunnels, heritage impacts would likely be avoided. Although there is some potential for heritage impacts, I am satisfied that the design depth of the tunnels would ensure any potential for heritage impacts is minimised. I consider the proponent's proposal to undertake vibration and settlement monitoring would be sufficient to ensure impacts are proactively identified and mitigated.

QHC also requested the proponent consider developing heritage conservation management plans and archival recording procedures in accordance with DEHP guidelines. The proponent has advised that project works would be assessed by the QHC in accordance with the process for development by the State under the QH Act. Furthermore, the DOEMP has been amended to reflect carrying out of archival recording in accordance with the DEHP's guideline on Archival Recording of Heritage Places. I am satisfied that the proponent's response and the amendment to the DOEMP would address this issue.

Further, QHC raised concern with the change application's consideration of the archaeological discovery provisions under the QH Act. The proponent advised that where project works are predicted to intercept items of cultural heritage significance, the proponent would undertake archival recordings of such material in consultation with DEHP. Furthermore, the DOEMP has been updated to reflect that archival recording should be carried out in accordance with the DEHP guideline. I am satisfied that consulting with DEHP in the development of cultural heritage management plans would ensure proposed archaeological discovery provisions are adequate.

Multiple submitters requested the proponent conduct additional condition surveys, and further consider monitoring and mitigation measures to manage settlement and vibration impacts. The proponent has advised that, where modelling indicates damage is likely due to project works, the proponent would consult with property owners to undertake dilapidation surveys completed by a suitably qualified person. I am satisfied that the measures in the management plan would ensure that the proponent undertakes vibration settlement monitoring in the vicinity of construction works at all identified heritage places along the project alignment, for the duration of construction works.

5.8. Social environment

The changed project has the potential to have both positive and negative social impacts. These include potential social impacts on:

- land and property ownership
- employment
- social infrastructure
- community health and safety.

The potential social impacts of the changed project are generally consistent with the potential social impacts of the project with the exception of potential property, social infrastructure and employment impacts. The changed project, overall, will have reduced property impacts due to its shortened rail alignment and reduced negative impacts on social infrastructure. Consistent with the project, the changed project will enhance access to key social infrastructure and employment zones within and surrounding the CBD.

5.8.1. Submissions received

The following social impact issues were raised in submissions received during the public consultation on the change application:

- the need for ongoing engagement with the local community
- opportunities for the community to provide input into impact mitigation planning
- the need for implementation of an effective complaints management procedure
- property-related impacts including acquisition of private property
- nuisance impacts to properties in close proximity to the surface work areas, such as noise, dust, vibration and traffic disruption
- impacts on sensitive places and social infrastructure such as the PA Hospital, CSIRO Ecosciences building and various sites and buildings of cultural/historic significance
- equitable access for persons with disabilities
- impacts to community health and safety, for example road safety (including cyclists and pedestrians), dust generation and handling of contaminated soil.

I have considered each submission and how the information provided by the proponent has responded to the submitter issues as part of my evaluation below.

5.8.2. Project-wide impacts and mitigation

Engagement

A comprehensive stakeholder engagement program was implemented by the proponent during the development of the EIS for the project and during public consultation for the EIS. Feedback received during the EIS process has been considered by the proponent in the design of the changed project.

The proponent has undertaken further engagement to support the change application, including:

- face-to-face meetings with key stakeholders including property owners, government departments, industry stakeholders and traditional owner groups
- letters to 1,488 potentially directly affected property owners
- doorknocks at 691 potentially directly affected properties
- three community information sessions, which were attended by over 200 people
- seven staffed displays at regional shopping centres, which were attended by over 500 people
- mail-out of a project newsletter (more than 1 million copies) throughout the south-east Queensland region
- distribution of 12,000 flyers at various transport interchanges
- static displays at six local libraries and four electorate offices
- newspaper announcements in 16 different south-east Queensland publications
- social media announcements via Facebook, LinkedIn and Twitter.

I consider these additional activities to be adequate for the purpose of stakeholder engagement on the change application.

During the construction of the changed project, the proponent has committed to engagement to enable stakeholders to obtain information and to discuss and provide feedback on the project, construction activities and environmental management measures. To ensure that the proponent's consultation and engagement activities are effective and responsive to stakeholder concerns during construction and operation, I have required the proponent prepare a community and stakeholder engagement plan (CSEP) for my approval, six months prior to the commencement of project works. The plan will be consistent with the outcomes, process and procedures provided in the DOEMP for the changed project and will be a sub-plan of the final OEMP. The proponent has committed to including the following in the CSEP:

- appointment of an independent community relations monitor who will monitor the effectiveness of the proponent's community relations activities during the construction and commissioning of the project
- location-specific community advisory groups to be convened by the proponent prior to the commencement of construction
- early establishment and maintenance of a comprehensive and accessible community project information service
- establishment of a procedure for receiving, investigating and responding to community complaints
- preparation of a monthly community relations report which will include a summary of complaints received.

I support these commitments, and consider that they demonstrate the proponent's commitment to ongoing and pro-active engagement with the community and stakeholders.

Employment

The changed project has the potential to result in significant direct and indirect employment benefits, during both construction and operations. The construction workforce of 1,547 full-time equivalents (FTEs) per annum for the changed project would be slightly less than the construction workforce of 1,600 FTEs for the project.. Post-construction employment opportunities (both direct and indirect) for the changed project are predicted to be higher than for the project at 576 FTEs, compared with 230 FTEs for the project.

The analysis in the EIS for the project predicted that the existing construction industry workforce within the greater Brisbane region will have sufficient capacity to meet the demands of the project (refer to Section 20.3.2 of the EIS). This prediction is however based on data from 2006, and the change application does not provide an updated analysis. More recent data published by Construction Skills Queensland[14] indicates that in December 2016 there were over 108,000 construction workers living within the greater Brisbane region. Assuming an unemployment rate of 5.7%, this equates to a potential surplus of more than 6,100 personnel. This more recent data supports the proponent's assumption that the existing labour pool within the local area will be sufficient to fulfil the majority of the workforce requirements for the project. The utilisation of a primarily local workforce by the proponent will also avoid the negative social impacts commonly associated with the influx of a large non-local workforce, such as increased pressure on housing supply and social services.

The proponent has committed to enhance benefits for local workers and businesses including development and implementation of a workforce training policy and local industry participation policy. The proponent has also committed to exploring options to provide enhanced training and employment opportunities for Indigenous persons.

The changed project will maintain or improve access to regionally significant employment locations such as the Brisbane CBD, Bowen Hills, the Royal Brisbane and Women's Hospital, QUT Gardens Point campus and Woolloongabba.

Property impacts

The shortened alignment proposed in the changed project has reduced the need for property acquisitions. A detailed review of these changes is provided in Section 5.2 (land). The project identified a total of 412 properties that would have been impacted by a whole or partial acquisition. Of these, 108 properties were required for surface works and 304 properties were for volumetric acquisition for underground tunnels and stations. The changed project identifies a total of 224 properties that would have been impacted by a whole or partial acquisition, comprising 29 properties required for surface works and 195 required for volumetric acquisitions. Surface acquisitions of commercial/industrial sites have reduced from 60 to 15, surface acquisition of residential sites has reduced from 39 to zero, and volumetric acquisitions of residential sites have reduced by 94. Consequently, the scale of the impacts resulting from the proposed private property acquisitions for the changed project has been significantly reduced when compared to the project.

[14] Construction Skills Queensland Data Centre, available at **http://csq.org.au/research/data-centre/workforce**

The reduced scale of the construction surface works for the changed project would also significantly reduce the number of properties which may be affected by construction-related amenity impacts, including construction noise, vibration, dust, construction traffic and visual impacts. For those properties which may still be impacted, the proponent has proposed mitigation measures in the DOEMP. The proponent has also committed to engaging with affected property owners to further develop these measures. Potential construction-related amenity impacts and associated mitigation measures have been assessed in detail in the following sections of the report:

- land-related issues—refer to Section 5.2
- traffic-related issues—refer to Section 5.4
- noise and vibration-related issues—refer to Section 5.3
- air quality and dust-related issues—refer to Section 5.5
- visual amenity-related issues—refer to Section 5.6.

Social infrastructure

Consistent with the project, the changed project would improve access to a range of important social infrastructure facilities including:

- educational and research facilities such as the QUT Gardens Point campus and the Ecosciences building
- medical facilities such as the PA Hospital and the Royal Brisbane and Women's Hospital
- recreational areas and public open space such as the Roma Street Parklands and the Brisbane City Botanical Gardens
- entertainment venues such as the River Stage, RNA Showgrounds and Suncorp Stadium
- various other facilities located within the Brisbane CBD.

The shortened alignment ensures a net reduction in negative impacts to social infrastructure for the changed project in comparison to the project, as sites such as the South Brisbane Cemetery and the Dutton Park Parklands will no longer be impacted.

The issue of equitable access to key social infrastructure for persons with disabilities was raised in public submissions. The proponent has committed to ensuring that the detailed design of the changed project, including the design of the new and upgraded stations, will comply with the access equity requirements of the *Disability Discrimination Act 1992*. I support this commitment and require it to be implemented.

Community health and safety

A number of construction-related community health and safety issues were raised in the public submissions on the changed project. These include potential safety impacts for road users, health impacts associated with dust generation (especially for sensitive sites such as the PA Hospital and the Leukaemia Foundation), and the potential health impacts associated with the management of contaminated soil. Further detail on these issues, including proponent commitments, and associated mitigation measures, are provided in the following sections of this report:

- traffic and transport (Section 5.4)—potential risks and mitigation measures related to road safety
- air quality (Section 5.5)—potential risks and mitigation measures related to air quality, including for sensitive locations
- hazard and risk (Section 5.11)—potential risks and mitigation measures related to general construction activities, including emergency response protocols
- spoil management and waste (Section 5.13)—potential risks and mitigation measures related to waste and contaminated spoil management.

5.8.3. Site-specific impacts and mitigation

This section provides an overview of the site-specific social impacts and mitigation measures for the changed project that differ from the original project.

The proponent has committed to undertaking early and ongoing consultation with the local community to inform the development of appropriate mitigation strategies to address construction-related impacts. To ensure consultation activities for construction are tailored to the specific requirements of each work site, I have imposed a condition requiring the proponent to prepare a community engagement plan (CEP) that will form part of each CEMP.

Southern portal

The changed project's southern portal will be relocated from Yeerongpilly to Dutton Park; therefore, the predicted impacts for the project south of Dutton Park Station will no longer occur. In particular, the South Brisbane Cemetery and Dutton Park Parklands will no longer be impacted. The southern portal worksite will be located in close proximity to the northern boundary of the PA Hospital, which would potentially result in increased construction phase impacts such as dust and noise when compared to the project.

Boggo Road Railway Station

The Boggo Road Railway Station in the changed project will be located approximately 125 m east of its location in the project. This would result in reduced construction phase impacts to Boggo Road Gaol and Dutton Park Primary School. Potential impacts to the PA Hospital, the Leukaemia Foundation ESA Village, Ecosciences buildings and residents along Railway Terrace and Merton Road would however be increased. Outlook Park (near Boggo Road Railway Station) will be required for station infrastructure.

Woolloongabba Railway Station

The changed project moves the Woolloongabba Railway Station east of its proposed location in the project. This will require the demolition of the South Brisbane Dental Hospital in addition to the demolition of the Goprint and Landcentre buildings proposed by the project. The proponent has committed to consulting with QH and the DHPW regarding the redeployment of the services provided by the hospital prior to demolition. There is also the potential for temporary closure of the Woolloongabba Busway during construction as a result of the changed project.

Albert Street Railway Station

The changed project moves the Albert Street Railway Station north-west along Albert Street compared with its originally proposed location. The changed project would require the demolition of buildings on the corner of Mary and Albert Streets. Noise from construction of the changed project at the Albert Street Station would have a potentially greater impact on apartments at 70 Mary and 108 Albert Street than for the original project. The proponent has committed to install an acoustic shed during construction works at this site to mitigate this impact. This would also reduce potential air quality impacts.

Roma Street Railway Station

The changed project moves the proposed underground Roma Street Railway Station 150 m south-west of its originally proposed location. The changed project will not provide the same level of direct pedestrian connectivity with the Roma Street Parklands and Spring Hill from the Roma Street Station. It will instead rely on existing connections with both the Roma Street Parklands and Spring Hill. Potential construction noise impacts to neighbouring Abbey Apartments would be increased under the requested change; however, this would be managed through the use of an acoustic shed.

Northern portal

Potential social impacts of the changed project at the northern portal are generally reduced compared with the original project. The changed location of the portal will avoid impacts on the recreation and community values associated with Victoria Park. Whilst the changed project will be closer to the Brisbane Girls Grammar School, modelling undertaken by the proponent indicated that operational noise will be within the criteria for the Exhibition Line Rail Corridor.

5.8.4. Coordinator-General's conclusion

Overall, I consider that the changed project will deliver positive social benefits. Potential negative social impacts can be effectively managed through compliance with the conditions which I have imposed, including the implementation of the CEMP.

I am satisfied that the proponent has undertaken adequate stakeholder engagement to support the change application, and that the commitments which have been made in the DOEMP regarding future stakeholder engagement demonstrate an effective, pro-active and inclusive approach. I have imposed a condition that requires the proponent to submit a CSEP as a sub-plan of the OEMP for my approval.

Overall, I consider that the changed project will result in positive impacts to employment, both due to project specific job creation, as well as the provision of improved accessibility to key employment locations in the Brisbane CBD. I am satisfied that the proponent's commitments in the EIS and DOEMP provide adequate measures to both mitigate negative impacts and enhance potential benefits.

The changed project will result in reduced property related impacts in comparison to the project. This includes impacts as a result of the acquisition of private property, as

well as construction related impacts to properties in close proximity to work sites. I am satisfied that the proposed mitigation and management strategies are appropriate.

The project will provide significant benefits in the form of improved access to key social infrastructure within and around the Brisbane CBD. Overall, the negative impacts of the changed application on social infrastructure are less than for the project.

The nature of impacts to community health and safety of the changed project is broadly comparable to the project. I am satisfied that the committed mitigation and management strategies for community health and safety are appropriate for the changed project.

Overall, the scope of the site specific social impacts would be reduced in the changed project due to its shortened surface alignment. The proponent has committed to engaging with the local community regarding the development of site specific mitigation measures for areas that may be impacted. I have imposed a condition requiring the proponent to prepare a CEP for each CEMP.

5.9. Economics

The change in economic impacts from the project relate to the reduction of the total length of the project, which would reduce the cost, resources and labour required for its delivery. The changed project is a $5.4 billion investment, and would provide over $1.2 billion in wider economic benefits for South East Queensland. The key economic benefits that the changed project would provide remain consistent with the project and include:

- an additional rail crossing under the Brisbane River near the Brisbane CBD, providing greater flexibility in working arrangements and reducing travel times
- greater railway capacity, enabling increased rail services across the South East Queensland network and expanding the rail network into new areas, encouraging economic growth and expansion
- enhanced connectivity between major residential growth areas, including Ipswich, Gold Coast, Sunshine Coast and Logan and key employment centres including the Brisbane CBD
- additional transport options for commuters, reducing congestion on roadways resulting in greater transport efficiency
- city-building opportunities, including construction activity and employment within and surrounding the CBD.

Business case

Building Queensland completed the business case for the changed project in 2016, stating the next steps for the delivery of the project relate to further investment consideration from the State Government.

The detailed cost benefit analysis (CBA) undertaken by the proponent was summarised in the change application and the key results are provided in Table 5.4. This analysis allows a comparison of the direct contribution to economic and social objectives between the project and the changed project.

Table 5.4 Comparison of the project and the changed project's CBA[15]

	Project	Changed project
Estimated cost of delivery	$8.9 billion (2010)	$5.4 billion (2015)
Benefit Cost Ratio (BCR)	1.42	1.41
Net Present value (NPV)	$2.345 billion	$1.877 billion
Wider economic benefits	$1.176 billion	$1.209 billion

[15] Source: Request for Project Change – Volume 1, February 2017

Building Queensland revised their assessment of the business case for the changed project following the introduction of the State Government's 'fairer fares' program and the European Train Controlling System (ETCS) across the network. The assessment concluded that the CRR project demonstrated a positive economic return in excess of the project's whole-of-life costs, delivering benefits to public transport, road users and the wider community.

5.9.2. Submissions received

Twenty-one submitters raised economic issues. Six were from organisations, 13 were private submitters and two were from state and local agencies. The key issues raised include:

- impacts to current use and future development of areas above and adjacent to the proposed alignment
- economic impacts to property owners or employees and the need for compensation
- community consultation on potential property impacts
- economic impacts to the freight network
- employment benefits of the project
- project demand.

I have considered each submission and how the information provided by the proponent has responded to the submitter issues as part of my evaluation below.

5.9.3. Impacts and mitigation

Employment opportunities

The change application states that the changed project would create 1,547 full-time equivalent (FTE) jobs during construction, a decrease from the 1,600 FTE jobs previously proposed. There would also be a change in the number of FTE operational jobs, although this would increase from 230 FTE to 576 FTE jobs for the changed project.

A submitter questioned the proposed employment benefits for the changed project, particularly the estimated jobs that would be generated by the project. The proponent advised that construction jobs for the changed project were estimated through the macroeconomic modelling technique known as Computable General Equilibrium (CGE) modelling, which is consistent with the technique applied in the assessment for the project.

I am satisfied that the proposed employment opportunities identified in the change application have been adequately assessed. I consider the creation of 1,547 FTE jobs during the construction of the project a beneficial outcome for South East Queensland job seekers.

I am satisfied that the changed project requires the employment of a highly skilled and diverse workforce. The proponent's commitment to the development and

implementation of a charter for local content for the project, in accordance with the Queensland Government Local Industry Policy, would ensure every opportunity is provided to local workers and businesses in the tendering process for the construction of the project.

Potential property use and property value impacts

As outlined in Table 5.1 in Section 5.2, fewer residential and commercial/industrial properties would be required than for the original project. The changed project would require:

- the acquisition of 15 commercial/industrial properties
- volumetric acquisition of 38 commercial/industrial properties
- volumetric acquisition of 141 residential properties to varying degrees.

With regards to potential property use and property value impacts, submitters raised issues relating to:

- the loss of the market value of properties due to the proposed resumption and/or demolition required for the construction of the project
- limitations to the future development of properties along the project alignment
- community consultation on potential property value impacts.

The proponent advises that where land is resumed for the project, compensation would be payable to a person with an interest in the land, in accordance with the *Acquisition of Land Act 1967*. The proponent would engage with affected property owners, including registered proprietors of properties required for resumption, as necessary. The proponent proposes to conduct further consultation with surrounding affected businesses and entities regarding the design of the project and impacts to potential future development.

I am satisfied that the proponent's commitment outlined in the DOEMP to provide on-going consultation with business owners near to construction worksites would ensure the potential impacts of the construction of the project are communicated and managed. I am satisfied that the proponent's commitment to the development and distribution of information packages to affected businesses providing information on available assistance services would assist with managing any potential business impacts during the construction of the project.

I am satisfied that property owners would be consulted prior to and for the duration of construction works, and that appropriate compensation avenues are available for any required resumptions.

Potential business and employment impacts

In the CGER I acknowledged that there would be localised, short-term, negative economic impacts of the construction of the project, due to its close proximity to businesses and residences. I note that the changed project would have a significantly reduced impact to residences and businesses, through reducing or avoiding the number of surface and volumetric properties previously required for construction.

Submitters raised issues with the project's construction impacting the operations of business within the vicinity of project works. Specifically, the RNA raised concern with the project's impacts on the running of the Ekka, and requested regular discussion with the proponent and the relevant contractor to manage construction impacts at the Exhibition showgrounds. The proponent responded that a detailed construction and staging programme would be further developed in detailed design, through close consultation with the RNA. I am satisfied that the concerns raised by the RNA would be addressed through consultation with the proponent.

I note that a submitter raised issues relating to the potential for job losses, due to the demolition of businesses in Albert Street. I acknowledge the concerns raised, however I note that the resumption of some businesses located within Albert Street is an unavoidable impact of the project. I consider that consultation undertaken by the proponent with the business owners and employees of the identified properties required for permanent resumption would ensure community concerns are addressed and positive outcomes are sought for those impacted.

Consistent with the conclusion in the CGER, I am satisfied that the proponent's commitments outlined in the project's DOEMP to provide on-going notification and consultation with business owners near to construction worksites would ensure the impacts are managed in accordance with community concerns.

Although some construction impacts such as demolition are unavoidable, I am satisfied that the proponent's commitment to the development and distribution of information packages to affected businesses providing information on available assistance services would assist with managing any potential business impacts during the construction of the project.

With regards to the concerns raise by the RNA, I consider the proponent's commitment to consultation with the RNA, specifically outlined in the DOEMP, and the formulation of a Community Advisory Group (CAG) including relevant RNA members, would ensure any construction impacts are managed to avoid negatively impacting the operation of the Ekka, or any other functions held at the Exhibition showgrounds.

A submitter also raised concern with the impacts the construction of the project may have on freight rail operations, and the associated economic impacts as a result of potential service disruptions.

The removal of the proposed additional surface tracks from Salisbury to Yeerongpilly for the changed project resulted from changes in the forecast freight demand, where existing demand for the freight network was calculated by the proponent at 50% of available capacity. Furthermore, the change report identified that the forecast demand could be accommodated within the existing rail network.

The proponent advised that a number of alternatives to meet increasing rail freight demand have been considered. Australian Rail Track Corporation (ARTC) has identified possible upgrades to the existing rail corridor extending to the Port of Brisbane that could progressively improve freight capacity. Long-term planning by others has identified a possible rail freight connection in a new corridor to the Port of Brisbane. This would provide for rail freight demand well into the future and free up existing track to meet growth in forecast passenger demand.

I am satisfied that any potential impacts to the existing freight network due to the construction of the project would be managed through construction development schedules and consultation with relevant freight entities and Queensland Rail.

Project demand

The change report states that since initial investigations for the project undertaken in 2008, the trend in rail patronage growth has slowed due to factors including fare policy, slower inner-city employment growth and ongoing investments in road and busway projects.

The introduction of the 'fairer fares' policy in January 2017 was predicted to increase rail patronage. Transport modelling was reassessed for the changed project to account for the policy and is provided in Table 5.5.

Table 5.5 Modelled average daily rail users to 2036[16]

Year	Average daily rail users
2015	177,200
2026	368,000
2036	511,700

From the predicted demand forecasts, the change report concluded that the existing capacity of parts of the inner city rail network would be exceeded by 2021. Without additional infrastructure through the city, it would not be possible to accommodate the predicted growth in service demand, nor could the rail network expand into new growth areas. The change report predicts that by 2036, forecast peak-hour demand would exceed existing capacity by 71% to the south, and 31% to the north.

The Cross River Rail project is offered as a solution to the predicted impacts, providing an additional crossing under the Brisbane River. It would also provide additional services to accommodate increased patronage and free up additional surface rail network capacity for the future.

I note that while a number of submitters questioned the demand for the project, submitters also raised alternative solutions with the aim of better utilising public space, more effective use of public funds, as well as alternatives to solve capacity issues on the Merivale Bridge. While these submissions are useful as an input into my evaluation, I am satisfied that the assessment undertaken by the proponent to consider alternative options has led to improvements in the current proposal.

[16] Source: Request for Project Change – Volume 1, February 2017

5.9.4. Coordinator-General's conclusion

I am satisfied that the proponent has assessed the potential economic impacts of the changed project and that the project would have positive economic impacts on local and state economies.

I acknowledge that there are likely to be localised, short-term, negative economic impacts of the construction of the changed project due to its close proximity to businesses and residences. However, the changed project has a positive BCR and would deliver economic benefits including more efficient development densities, better access to employment, improved labour supply, and more efficient and reliable public transport and road networks.

I am satisfied that the proponent's commitments outlined in the DOEMP to implement workforce and local procurement management plans would manage any potential negative impacts that may arise as a result of the project.

With regards to impacts on property values, I note that delivery of any new infrastructure project is assumed to impact property prices and value, both positively and negatively. Due to the nature of the Cross River Rail project, property impacts are unavoidable. However, I am satisfied that through consultation with surrounding affected business owners, employees and residents, the potential impacts would be addressed and managed appropriately.

5.10. Water resources

The changes to the project that would have an influence on the previously identified water resource impacts include:

- avoidance of works south of Dutton Park Railway station, removing the previous impacts at Moolabin and Rocky Waterholes Creeks
- change in the tunnelling methodology from Boggo Road to Woolloongabba, with an associated increase in potential groundwater drawdown
- changed creek crossing construction design at Mayne Rail Yard, increasing the potential for impacts to Breakfast/ Enoggera Creek.

Potential water resource impacts of the changed project include:

- impacts to surface water and groundwater quality from the addition of sediments, litter, toxicants and pollutants from surface construction works, with resultant impacts to aquatic biodiversity
- disturbance of potential acid sulfate soils and contaminated soils during spoil removal and surface construction works, potentially entering nearby waterways and resulting in reduced water quality and aquatic biodiversity
- changed floodplain and flooding behaviour in creeks surrounding construction worksites, resulting in increased flood peak levels and altered throughput of flood waters
- increased groundwater drawdown during tunnel construction, including impacts to groundwater-dependent ecosystems (GDEs)
- impacts to the amenity, cultural and spiritual values of waterways.

5.10.1. Submissions received

Eight submitters raised water resources issues. One was from an organisation, four were private submitters and three were from state and local agencies. The key issues raised include:

- flooding potential of Mayne Rail Yard
- flooding impact, mitigation and management of Albert Street Railway Station
- flooding immunity of Roma Street Railway Station
- consideration of climate change impacts in the project's design and mitigation measures
- reporting and review of the proposed hydrogeological model and ground water quality monitoring program
- identification of GDEs within the project corridor
- construction impact to overland flow paths surrounding the PA Hospital.

I have considered each submission and how the information provided by the proponent has responded to the submitter issues as part of my evaluation below.

5.10.2. Site-specific impacts and mitigation

Potential surface water impacts during construction

The changed project no longer requires works south of Dutton Park Railway Station. As a result, construction works within waterways would be avoided, therefore removing the need for the proposed bridges at Moolabin Creek and Rocky Waterholes Creek at Yeerongpilly and Moorooka.

The change application predicts that the surface water flow and sediment runoff impacts of the changed project would be reduced in comparison to the project, despite the alignment being located closer to Breakfast/ Enoggera Creek.

Boggo Road Railway Station is predicted to be more susceptible to impacts from stormwater drainage than the project. The change application identified the need for further design of the on-site stormwater network during detailed design to ensure overland flows are not impacted by construction works and in turn impact those works. The changed location of the northern portal would be located within an area affected by overland flooding identified in BCC's flood awareness mapping.

Flooding

The change application predicts that the proposed construction surface works within Mayne Rail Yard would not impact the floodplain or the flooding behaviour of Breakfast/Enoggera Creek. The crossing at Breakfast/Enoggera Creek is also no longer required, due to a change in construction design. Further detailed flood modelling at Mayne Rail Yard during the project's detailed design phase would be required, to ensure that the design of the changed project responds to potential flooding impacts.

In its submission, BCC requested that the proponent consider providing appropriate flood immunity for the proposed general construction site area at the rear of the PA

Hospital, which is currently affected by an overland flow path. The proponent responded that the performance criteria within the DOEMP would ensure that all construction activities and worksites would not contribute to or re-direct flood waters over adjacent properties. I am satisfied that the implementation of the performance criteria into the design of the project, and the mitigation measures outlined in the DOEMP would ensure the overland flow path at the PA Hospital is not affected by construction works.

Sedimentation

Sedimentation has the potential to impact waterways surrounding project works, and has the potential to occur as a result of construction activities including:

- vegetation clearing
- demolition of existing infrastructure
- earthworks associated with track work
- road/footpath realignment
- tunnel construction activities
- spoil removal, placement and haulage road use.

The change application identified the Brisbane River and Breakfast/ Enoggera Creek as the closest receiving environments to the changed project alignment. While worksite areas would be similar in size to the project, there would be less spoil removal, demolition and vegetation removal required.

Construction water use

The change application states that water used during construction for dust suppression, compaction, wheel wash down, grout, firefighting supply and human consumption would be sourced from recycled water. No project related impacts are anticipated due to the quantities anticipated to be used. Any runoff would be managed in accordance with the project's CEMP.

Contaminated land

The change application identified that the risk of encountering and disturbing contaminated land has reduced compared to the project. This is due to the avoidance of works south of Dutton Park Railway Station, especially land adjacent to Moolabin, Rocky Waterholes and Stable Swamp Creeks. Accordingly, the potential for impacts to surface water resources from contaminated land disturbance has reduced.

However, the potential for encountering contaminated land and the potential for contaminated land impacts to surface water resources at the Albert Street Railway Station worksite is expected to be consistent with the project. Potential contaminated land impacts are further discussed in Section 5.1 Land.

Litter, toxicants and accidental spillages

The change application identified that litter, toxicants and accidental spillages have the potential to impact Breakfast/Enoggera Creek during the construction and operation of

the changed project. Mitigation and management for potential impacts are provided in the project's DOEMP.

Mitigation and management measures

New surface water mitigation measures required for the changed project include:

- collection, treatment, diversion and assessment of wastewater generated from construction activities via water treatment facilities
- capturing, treating and discharging water captured in the underground stations as trade water to the QUU sewer network.

Potential groundwater impacts during construction

The assessment undertaken to determine the changed project's potential impacts to water resources focussed on Woolloongabba and Boggo Road Railway Stations, due to the change in methodology from bored to mined tunnelling in this section of tunnel.

Water resources impacts to other sections of the changed project are expected to remain consistent with the project, or where alternative construction and mitigation measures were proposed, no adverse impacts were identified.

Notably, owing to the change in alignment and tunnelling methodology, the risk of groundwater drawdown between Boggo Road and Woolloongabba Railway Stations has increased from the project. Accordingly, groundwater drainage methods have been adapted for the changed project, as summarised in Table 5.6.

Table 5.6 Comparison of groundwater drainage measures[17]

Location	Reference project	Changed project
Boggo Road Railway Station	Drained	Cut and cover undrained above rock, base of cut and cover to be drained
Boggo Road to Woolloongabba	Undrained—segmental linings with gaskets and undrained cross passages	Undrained mined tunnels
Woolloongabba Railway Station	Undrained section for cut and cover elements protruding bedrock into weathered rock and alluvium. Drained construction for the base of the station and cavern elements	Cut and cover works to be undrained above bedrock with a drained base structure, Northern mined cavern to have a drained base and undrained arch. Southern mined cavern to have a drained cavern and base
All other underground Railway Stations (Albert and Roma Street Railway stations)	Station locations would be drained in the rock and undrained in the alluvium.	Same as CRR2012 for Albert Street and Roma Street Railway stations. The upper parts of the walls will be undrained through the more permeable ground (within the fill and alluvial deposits). All the base slabs for the underground stations will be drained

[17] Source: Request for Project Change – Volume 1, February 2017

Tunnels (TBM)	All tunnel sections would be constructed by TBM and would be undrained. Tunnels would be lined with pre-cast segmental concrete linings. Gaskets would be included wherever these linings were used to create a waterproof lining	Consistent with CRR2012
Cross passages	Undrained	Consistent with CRR2012

The change application states that contaminant transport in groundwater would be influenced by the drawdown effects of tunnel construction and operation. If the tunnel acts to drain contaminated water, the contaminated water would be captured by the drainage system and transferred to a local treatment plant. Contaminated water would then be treated and discharged to an approved point or discharged into the sewer network, subject to Queensland Urban Utilities (QUU) approval.

The extent of groundwater drawdown associated with underground construction is also likely to extend into areas of PASS for the changed project. If the construction of the project lowers groundwater levels in areas of PASS, the oxidised acidic materials could enter groundwater and degrade groundwater quality.

The change application identified that new mitigation measures are required for the changed project, in addition to those previously identified. New groundwater mitigation measures required for the changed project are summarised in the relevant sections below.

Southern portal and Boggo Road Railway Station

The cut and cover section of Boggo Road Railway Station is proposed to be undrained (above rock) with a drained base. The change application states that the construction of the changed Boggo Road Railway Station is expected to encounter contact zones between the Brisbane Tuff, Aspley Formation and Normanby Fault rock formations, where there is increased risk of permeability and groundwater inflows. The change application identifies that groundwater inflows would be manageable with probing and grouting, including the drainage measures outlined in Table 5.6. Probing would be undertaken to identify any groundwater that may be present in underground cavities while grouting would seal cavities restricting the inflow of groundwater.

Boggo Road Railway Station to Woolloongabba Railway Station

The identified potential increase in groundwater drawdown from Boggo Road to Woolloongabba Railway Stations would be managed through progressive installation of permanent tunnel lining. This would arrest the inflow of groundwater, allowing the water table to return to its preconstruction levels.

The change application identified the need for further investigations to be undertaken during detailed design, which would include:

- further development of a geological and hydrogeological model

- groundwater cut off to prevent excessive drawdown during construction and operation
- investigation and testing to develop an understanding of the local hydraulic connectivity and rock head condition, and to determine specific requirements for achieving cut off
- investigation in relation to the potential to interact with major groundwater transmissive features, such as the Normanby Fault
- borehole investigations, groundwater monitoring and permeability testing on underground sections to better characterise major transmissive features and constrain the hydrogeological model for detailed design.

Mitigation and management measures

The proponent has identified that the following groundwater mitigation measures would now be required for the changed project, in addition to those previously identified:

- ensuring pumps, holding tanks, pipes and water treatment facilities are appropriately sized to accommodate groundwater inflow rates
- for all underground stations, further work is required to estimate inflow rates for groundwater and grey water, including station deluge water and station and tunnel cleaning water
- determining the size and location of water treatment facilities to allow for economic and/or space constraints within the city station locations
- additional discussions to determine suitable water quality and appropriate discharge location/s or determine suitable locations for water treatment either within the project boundaries or off-site.

Potential surface water impacts during operations

Sediment accumulation and runoff from rail infrastructure has the potential to impact surface water resources surrounding project infrastructure, following heavy rainfall events. The change application identified the potential for increases in water flow velocities or frequencies due to increased stormwater runoff from the sealed surfaces of the changed project. This could potentially lead to creek erosion and a subsequent decline in water quality and aquatic habitats.

Flooding

The DOEMP identified that the project design is based on current flooding information to achieve flood immunity to the tunnel infrastructure and underground stations in a 1-in-10,000-year annual exceedance probability (AEP) regional flood event, and a 1-in-100-AEP overland flow event.

Albert Street Railway Station

The relocated Albert Street Railway Station would have a similar flood risk to the project, where station entrances would be approximately 4.3 m Australian Height Datum (AHD).

Submitters raised issues with potential flooding impacts, mitigation and management at the proposed Albert Street Railway Station. The change application states that Albert Street Railway Station would feature three levels of flood protection to accommodate 1-in-100, 1-in-800 and 1-in-10,000-year AEP flood events, and alternative flood measures such as flood gates at the concourse or platform level would be considered during detailed design.

As the changed project has improved flood protection measures at all underground stations, particularly proposing a wider range of protection measures at Albert Street Railway Station, I am satisfied that the project would achieve flood immunity at the Q10,000 design level.

Roma Street Railway Station

A submitter raised issues with the flood immunity of Roma Street Railway Station. The CGER found that the proposed works at Roma Street Railway Station would unlikely affect overland flow paths, and residual effects on flood management during operations were considered to be low over the long term. The proponent responded that the flood immunity requirements of Roma Street Railway Station would be further investigated during detailed design.

Mayne Rail Yard

The change application identified the potential for the proposed underpass at Mayne Rail Yard to be affected during a flooding event, concluding that further flood modelling during detailed design would be required to ensure the changed project is also not adversely affected by flooding during operation. Similarly, the worksites for the northern and southern portals may also be affected by overland flooding during the operation of the project.

I note that a submitter raised issues with the flooding potential of Mayne Rail Yard. The proponent responded that while the siting and location of the trough structure for the underpass at Mayne Rail Yard had considered flooding, remediation of flooding conditions that presently exist at Mayne Rail Yard is outside the scope of the changes to the project.

Climate change impacts

Submitters requested that the proponent consider potential future climate change impacts in the flooding impact assessment. The DOEMP provides the Environmental Design Requirements that the project is designed to be adaptable to conditions that may arise as a result of climate change, including accommodating the predicted 1.0 m sea level rise upper-range scenario in 2100. The proponent also reported that additional flood mitigation such as automatic flood barriers and backflow devices would be considered during detailed design. I am satisfied that climate change impacts would be addressed through achieving the Environmental Design Requirements for the project.

Mitigation and management measures

New additional flooding mitigation measures would include:

- providing staged flood protection at Albert Street Railway Station
- designing on-site stormwater networks to minimise the risk of overland flow entering the tunnel portal and stations
- implementation of a range of mitigation measures to:
  - prevent flooding of construction worksites in a 1-in-20-AEP event
  - prevent flooding of bulk storage facilities for hazardous substances in a 1-in-50-year AEP event.
- allow continued access to the local road network from construction worksites during flood events up to a 1-in-50-AEP event
- designing construction worksite to not cause or contribute to afflux for a 1-in-5-AEP flood event or greater on the floodplain of any waterways or overland flow paths
- designing construction activities, including temporary works and spoil placement to prevent flood waters being re-directed over other private property
- monitoring rainfall and rising water levels during operation, and commencing flood preparation and emergency response procedures when the potential for floods arise. Prior to recommissioning, inspections and tests will be undertaken to ensure that all systems and services are functioning correctly
- further detailed flood modelling during detailed design of Mayne Rail Yard.

5.10.3. Coordinator-General's conclusion

Groundwater

I am satisfied that the change application has identified the changes to potential groundwater impacts during the construction of the project. I note the change application predicted there would be minimal to no change to groundwater drawdown impacts at Albert Street Railway Station, Roma Street Railway Station, the northern portal and Mayne Rail Yard.

I have imposed a condition (Appendix 1) which requires the proponent to ensure that discharge of groundwater from project works must comply with the Brisbane River estuary environmental values and water quality objectives (Basin No.143 mid-estuary) referred to in the EPP (Water) Policy 2009.

I have imposed a condition (Appendix 1) requiring the proponent to monitor and report on water quality in accordance with a Water Quality Monitoring plan. I expect that the proponent implements a groundwater monitoring programme at all construction work sites, as part of the Water Quality Monitoring plan, in accordance with the project's DOEMP.

The Water Quality Monitoring programme should:

- monitor groundwater within the tunnels
- monitor groundwater water level drawdown as a result of the project
- assess the quality of groundwater being intercepted
- assess actual and potential contaminant (ASS) migration or drainage in groundwater

- identify site specific parameters which would indicate a need for further groundwater management, including treatment
- measure and monitor the volume of groundwater to be released.

In accordance with the DOEMP, groundwater quality measures within construction worksites should be within 10% of background levels, established prior to disturbance.

The Water Quality Monitoring plan should also outline mitigation measures in accordance with the DOEMP, such as:

- handling procedures for fuels, chemicals and other hazardous materials
- procedures to prevent or contain spills, and to ensure that accidental spills are cleaned- up and appropriately remediated to avoid contamination of groundwater seepage
- practices and procedures for waste handling, storage and disposal, and spillages to avoid contamination of groundwater.

Furthermore, I expect that, in accordance with the project's DOEMP, where monitoring indicates an exceedance of the water quality objectives, or an uncontrolled release of contaminants, chemicals or fuels occurs:

- corrective actions and mitigation measures, including ceasing the release, are to be implemented immediately
- undertake notification required by law
- investigation and additional mitigation measures are to be implemented to address the non-conformance.

In consideration of the increased potential for groundwater inflow from Boggo Road Railway Station to Woolloongabba Railway Station, I have also imposed a condition (Appendix 1) which requires the proponent to undertake predictive modelling of the potential for groundwater drawdown, prior to the commencement of works. Works must be managed to avoid or minimise inflow of groundwater to the project works and the proponent must monitor the inflow of groundwater to project works, revise work methods and devise and implement mitigation measures as soon as practicable where necessary.

In its submission, DNRM requested that the proponent consider further assessment of the changed project's potential impacts on GDEs within the project corridor. I note that there has not been a significant change in the project's alignment to encounter new GDEs compared to the previous alignment. However, in consideration of these concerns I have imposed a condition (Appendix 1) requiring that the proponent models the potential for groundwater drawdown, and ensures that works are designed, planned and implemented to avoid where practicable and otherwise minimise the inflow of groundwater to the project works.

The Environmental Design Requirements in Schedule 1 of the imposed conditions, include requirements for the proponent to develop a hydrogeological model and undertake groundwater monitoring. I am satisfied that the imposed condition and the Environmental Design Requirements would ensure the potential for groundwater drawdown is monitored and managed to avoid adverse impacts to GDE's.

The Environmental Design Requirements also require the proponent to ensure that the project is designed to be adaptable to conditions that may arise as a result of climate change, including accommodating the predicted 1.0m sea level rise scenario in 2100. I am satisfied that this would address submitter concerns relating to the adaptability of the project.

To support this, I have imposed a condition (Appendix 1) requiring that the project must be designed to achieve the Environmental Design Requirements in Schedule 1. I have imposed a condition requiring that the proponent must give written notice to the Coordinator-General that the project has achieved the Environmental Design Requirements at the completion of commissioning. I expect that the proponent ensures that all reasonable and practicable measures are taken to avoid, or mitigate and manage the impacts.

It its submission, DNRM requested the proponent implement a reporting and review process for the proposed hydrogeological model. The proponent has advised that the hydrogeological model could be provided to DNRM for review, following further development during detailed design. Accordingly, I expect the proponent to inform DNRM regarding subsequent groundwater investigations and results of modelling.

DNRM also recommended in its submission that the proponent undertake groundwater modelling on a quarterly basis as a minimum, an increase to that proposed in the DOEMP. Subsequently, the proponent has updated the DOEMP to incorporate this recommendation and I am satisfied that this amendment would resolve this issue.

Surface water

I am satisfied that the proponent has identified the changes to surface water impacts during both construction and operations. I note the reduced impact to surface water resources due to the avoidance of works to the south of Dutton Park Railway Station and consider this a beneficial outcome.

In accordance with imposed conditions, I require the proponent to develop an erosion and sediment control plan in accordance with the DOEMP. I expect that the plan outlines mitigation measures to address the potential for sedimentation impact to waterways surrounding project works.

I have imposed a condition (Appendix 1) which requires the proponent to ensure that discharge of surface water from project works must comply with the Brisbane River estuary environmental values and water quality objectives (Basin No.143 mid-estuary) referred to in the EPP (Water) Policy 2009. The imposed conditions also require the proponent to monitor and report on surface water quality in accordance with the Water Quality Monitoring plan.

I expect that, as part of the Water Quality Monitoring plan, the proponent undertakes surface water quality monitoring prior to, during and subsequent to construction, to monitor all discharges from construction worksites to all identified receiving waters. I expect the Water Quality Monitoring programme to include, but not be limited to:

- a description of potentially affected water bodies
- construction activities at each worksite and the potentially associated contaminants

- specific monitoring locations, including upstream and downstream surface waters at each construction worksite
- frequency of monitoring, including prior to discharge of any surface water from each construction worksite at lease weekly and immediately following a defined rainfall event
- a process for conducting a visual assessment of all waterways within and adjacent to worksites during routine daily site inspections and immediately following any rainfall event causing runoff from the worksite to:
  - determine the presence of litter, sediments, chemical plumes or other toxicants
  - inspect all erosion and sediment control measures, bunding and water treatment facilities to assess any damage or maintenance requirements and to review effectiveness.
- a program for undertaking the identified additional investigations during detailed design, including:
  - stormwater network analysis for Boggo Road and any other areas of the project likely to influence stormwater runoff and drainage in operation
  - flooding analysis of Mayne Rail Yard and flooding potential of Roma Street Railway Station.

I am satisfied that these requirements would ensure the identified need for additional flooding modelling and assessment is undertaken, where required. I expect that these investigations would further identify the potential flooding impacts at the construction worksites, and inform any additional mitigation measures required to ensure the project is not adversely affected by flooding during both construction and operational phases.

I also expect that the Water Quality Monitoring plan details:

- surface drainage measures to be implemented at all construction worksites and work areas to manage stormwater runoff
- storage provisions for all chemicals, oils, fuels, regulated wastes, cement and concrete, and any empty and unwashed drums on a concrete hardstand area, sheltered and bunded to avoid release of contaminants
- a process for where monitoring indicates an exceedance of the EPP(Water) of Queensland Water Quality Guidelines:
  - corrective actions and mitigation measures, including ceasing the release, are to be implemented immediately
  - undertake notification required by law
  - investigation and additional mitigation measures are to be implemented to address the non-conformance.
- measures for the collection, treatment, diversion and assessment of wastewater generated from construction activities
- requirements to locate spoil placement sites away from creek banks and provide adequate bunding to prevent sediments run-off into waterways or stormwater drains, or inundation in a 1-in-5-year flood event
- adequate bunding or level differences to protect against local flooding for a 1-in-20-AEP flood event

- flood protection measures to ensure project works have no impact to third parties for a 1-in-5-AEP flood event or greater
- emergency procedures for each worksite to facilitate the safe and efficient evacuation on the event of flooding
- a procedure for monitoring actual and potential flood events during construction, and a procedure for warning all construction site staff if flooding is considered likely.

The proponent has advised that it will continue the collaborative working relationship with the QFES during the procurement and detailed design phases of the Project. Accordingly, I expect that any additional mitigation measures relating to flooding and evacuation are developed in consultation with QFES.

I have imposed a condition (Appendix) requiring the proponent to ensure that project works and worksites are designed and implemented to avoid inundation from stormwater due to a 2 year (4hr) ARI rainfall event and flood waters due to a 5 year ARI rainfall event. The imposed conditions also require that project works must be designed and implemented to avoid afflux or cause the redirection of uncontrolled surface water flows, including stormwater flows, outside of worksites.

I am satisfied that these imposed conditions would ensure the issues relating to flooding impacts to overland flows would be addressed and managed at all proposed worksites, including the proposed site at the PA Hospital.

I note that the Environmental Design Requirements outlines the relevant surface water requirements for the project, including additional flooding investigations to be undertaken during detailed design at Mayne Rail Yard. Furthermore, I have imposed a condition (Appendix 1) requiring that the proponent must give written notice to the Coordinator-General that the project has achieved the Environmental Design Requirements at the completion of commissioning.

5.11. Hazard and risk

This section discusses the changes to hazard[18] and risk[19] from the changed project. The hazard and risk register for the project was reviewed to identify where changes will occur to the identified hazards and where new hazards may arise.

The changes to the project that would impact on hazard and risk include:

- the demolition of BTC (West Tower) at Roma Street station
- flooding at Albert Street Railway Station and the northern portal due to changes in location
- inclusion of mined tunnelling from Woolloongabba to Boggo Road
- integration of the European Train Control System (ETCS).

[18] Department of Infrastructure, Local Government and Planning (DILGP), State Planning Policy – State interest guideline – Natural hazards, risk and resilience, DILGP, 2006.
[19] Standards Australia/Standards New Zealand, AS/NZS ISO 31000:2009 – Risk management – Principles and guidelines, Standards Australia, Sydney and Standards New Zealand, Wellington, 2009.

5.11.1. Submissions received

The key hazard and risks issues raised in submissions on the changed project included the following:

- consultation regarding emergency egress planning for people with a disability to ensure standards are applied consistently and best practice strategies are adopted
- disturbance of gas mains and electricity transmission networks that run under streets and housing
- compliance with relevant Queensland statutory legislation and implementation of safety and health management systems to mitigate hazard and risk
- the effect of settlement of 50 millimetres on underground services, particularly gravity services such as stormwater or sewerage
- exposure to silica with the potential to cause silicosis from tunnelling.

I have considered each submission and how the information provided by the proponent has responded to the submitter issues as part of my evaluation below.

5.11.2. Impacts and mitigation

Construction

The potential impacts during construction are largely comparable to those detailed in the project. A key alteration to the commissioning of the changed project is the integration of the ETCS and associated systems and signalling. The ETCS – Inner City Project is to be procured separately and will deliver the ETCS Level 2 technology within the existing inner city network between Milton and Northgate. The changed project will integrate the design development of ETCS in the tunnels with the ETCS – Inner City Project.

An assessment of the present of asbestos in building proposed to be demolished will be undertaken prior to the construction tender being issued. I am satisfied that asbestos removal will be managed through the OEMP. Asbestos is further discussed in Section 5.2 (land).

I am recommending that mined tunnelling be implemented in accordance with the *Work Health and Safety Act 2011 – Tunnelling Code of Practice 2007* and the Excavation work Code of Practice 2017[20] .

With regard to public exposure of silica[21] and other airborne contaminants at public places, allowable concentrations are controlled through various human health objectives stipulated for dust particulates in the EPP (Air) Policy. This includes concentration thresholds for PM_{10} and $PM_{2.5}$. An analysis of dust impacts predicted at sensitive places across the project site has been provided at Section 5.5 of this report (air quality).

[20] Department of Justice and Attorney General, Workplace Health and Safety Queensland – Excavation work – code of practice 2013.
[21] Workplace Health and Safety - Electrical Safety Office – Workers' Compensation Regulator – *Construction dust: respirable crystalline silica*

The *Work Health and Safety Act 2011* establishes the regulatory framework for health and safety at work, which includes requiring employers to manage risks from airborne contaminants in the workplace. Under these requirements employers must ensure exposure standards for substances are not exceeded and monitor airborne contaminant levels to ensure there is no risk to health. The framework requires risk assessments to be prepared with regard to concentrations of airborne contaminants in confined spaces and any predicable changes to those concentrations. Emergency workplace procedures must be identified and undertaken.

On 22 March 2017, the Coal Workers' Pneumoconiosis Select Committee tabled an interim report: *Inquiry into the identification of coal workers' pneumoconiosis in Queensland – interim report* with the Queensland Parliament. The committee has heard testimony regarding the effects of silica on quarry workers, tunnel workers, metal miners and anyone who is disturbing the earth's crust and drilling. I am therefore recommending that the relevant findings from this report are considered and implemented in the Hazard and Risk plan and the Air Quality plan.

Operation

Operational impacts for hazard and risk are similar to those identified in the project, which include:

- train incidents
- maintenance works on the rail line
- collapse, subsidence or failure of tunnel and other components
- flooding and acts of terrorism leading to major fires, explosions or other hazardous consequences

The DOEMP proposes a range of hazard and risk measures, including environmental design requirements that must be achieved and verified through the detailed design process. I am satisfied that the DOEMP appropriately manages the potential hazard and risk for the changed project.

Mitigation and management measures

Mitigation measures outlined in the DOEMP for the changed project include:

- develop and implement a risk management plan that considers the potential risks associated with construction
- 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
- establish procedures for communication with the Rail Infrastructure Manager regarding construction activities in or near the rail corridor and potential hazards and risks

- establish procedures for communication with TMR and BCC about potential hazards and risks associated with construction activities in or near to state and local roads, and busways.
- ensure that the storage of flammable and combustible liquids complies with AS 1940 and the *Work Health and Safety Act 2011.*

The proponent has committed, through the DOEMP to preparing and implementing a Commissioning Hazard and Risk Management plan. The operation impacts will be managed as required by the Rail Infrastructure Manager and TMR procedures.

5.11.3. Coordinator-General's conclusion

I consider the predicted construction and operation impacts of hazard and risk generated by project activities of the changed project similar or reduced to those expected for the project. I concluded, for the project, that hazards and risks would be appropriately managed during the construction and operation of the project. I determined the need to evacuate the underground tunnel and stations in the event of an emergency was assessed as having the highest risk level, which is unchanged due to the changed project.

The potential need to remove asbestos before buildings are demolished is a matter that will require further investigation prior to demolition of relevant buildings. I am satisfied that through the OEMP and relevant sub plans, asbestos will be adequately managed.

In response to concerns raised by private submitters in regards to silicosis, I recommend the proponent incorporate any relevant findings from the Coal Workers' Pneumoconiosis Select Committee final report, *Black Lung White Lies – Inquiry into the re-identification of Coal Workers' Pneumoconiosis in Queensland* which was tabled on Monday, 29 May 2017.

As construction and operation hazards and risks for the changed project will be addressed in accordance with the legislative requirements and implemented through the OEMP, I do not consider it necessary to condition hazards and risks and therefore Imposed Condition 26 from the project is no longer relevant. I am satisfied that this approach sufficiently manages hazards and risks.

5.12. Nature conservation

As the changed project is within a highly urbanised area, the changed project's overall impact on flora and fauna is expected to be minimal, which is consistent with the project.

The key changes to the project impacting on nature conservation include:

- relocation of the northern portal from Victoria Park to the rail corridor (Exhibition Line) resulting in no removal of vegetation from Victoria Park for the rail line
- no vegetation removal from Emma Miller Place or the planted roadside vegetation along Alice Street
- reduced impact to vegetation at Exhibition Railway Station, including the reduction of impact to the existing fig trees

- removal of vegetation around Boggo Road Railway Station worksite (including Outlook Park (which is considered 'Council controlled vegetation')
- greater potential to indirectly impact Black Flying-foxes due to the north-bound track passing closer to the Breakfast/Enoggera Creek bank.

5.12.1. Submissions received

There were 10 submitters who raised issues around nature conservation, of which eight were private individuals. The key issues raised include:

- potential impacts to vegetation (loss of trees and green space) in Victoria Park, including the bike pathway realignment
- rehabilitation of construction sites following construction, including the BCC Depot at Victoria Park
- contractor management to avoid further damage to Victoria Park
- protection of the Moreton Bay Fig tree at Boggo Road Railway Station
- relocation of playground equipment from Outlook Park to another suitable location.

I have considered each submission and how the information provided by the proponent has responded to the submitter issues as part of my evaluation below.

5.12.2. Project-wide impacts and mitigation

Pests and weeds

Potential impacts during construction on pests and weeds will remain similar to the project, although the impacts would vary slightly due to the changes in station locations. Invasive fauna species including the European fox (*vulpes vulpes*) (Category 3 invasive animal) and cane toad[22] exist within the study corridor; however, the changed application outlined that the project would not increase the distribution or occurrence of these species within the local area.

I note the proponent has committed through the DOEMP to the preparation of a pest and weed management plan to address plant and animal pests which will include mitigation and management measures. This plan would be implemented prior to the commencement of any project works. The proponent has also committed, through the DOEMP, to ensure that construction activities do no cause the introduction or spread of pest species.

Mitigation and management measures

Mitigation measures required for the changed project include:

- all project sites receiving fire ant carriers must ensure that a Biosecurity Instrument Permit is provided by the supplier, or a Biosecurity Queensland certified inspection certificate is supplied for fire an carriers

[22] Department of Agriculture and Fisheries, Restricted matter - **https://www.daf.qld.gov.au/biosecurity/about-biosecurity/biosecurity-act-2014/biosecurity-matter/restricted-matter**

- ensure appropriate soil hygiene procedures are followed to prevent spread of pest plants and animals, and potential soil pathogens
- prior to 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.

5.12.3. Site-specific impacts and mitigation

Boggo Road Railway Station

A submitter raised a concern regarding a mature Moreton Bay fig tree at Boggo Road Railway Station and requested this tree to be protected. The proponent has advised that it does not propose to remove this tree, and where possible the proponent would adopt pruning and selective trimming of mature trees in preference to removal.

The proponent has committed through the DOEMP, to minimise disturbance to significant vegetation and habitat during construction by clearly marking and mapping vegetation to be retained. I require the proponent to implement the CEMP.

Northern portal

The changed project proposes to relocate the northern portal from Victoria Park to within the rail corridor (Exhibition line). This change would avoid any direct loss of mature vegetation within Victoria Park, significantly reducing the impacts previously identified for the project. I note the number of submissions received relating to the mature vegetation in Victoria Park, which clearly is highly valued by the community for its contribution to scenic amenity in the local area. I am satisfied that the changes to the project have reduced the impact to mature vegetation in Victoria Park and I consider the changes a beneficial outcome.

Although the changed project still requires the realignment of the existing bike path through Victoria Park, the proponent has committed to where possible, avoiding or minimising the impact to mature vegetation through the implementation of the OEMP and relevant construction sub-plans. The proponent has advised in their response to submissions, that the bike path is required to maintain safety for pedestrians and cyclists during the construction phase. The DOEMP also commits the proponent to minimising the loss of public open space in Victoria Park during construction.

Mayne Rail Yard

The changed project would be located closer to the Breakfast/Enoggera Creek riparian zone than the project. The change application outlined that riparian vegetation adjacent to Mayne Rail Yard supports a roost used by the black flying-fox (*Pteropus alecto*). The proponent has advised that this roost is part of the National Flying-fox Monitoring Program (NFFMP) and historical data indicate that it seldom supports significant numbers of individuals.

The black flying-fox is protected under the *Nature Conservation Act 2014* (NC Act). During a flying-fox assessment undertaken by the proponent in July 2016, three Black flying-foxes were recorded as present. Although the change application concluded that the changed project would not directly impact on the black flying-fox, there is the

potential for indirect impacts due the close proximity of the rail line to the roost area. The proponent in its change application has indicated that Queensland Rail has an existing EMP specific to Mayne Rail Yard which provides a number of measures to protect the black flying-fox.

The proponent has committed, through the DOEMP, to no net loss of habitat occurring as a result of the design or construction of the project.

Mitigation and management measures

Mitigation measures required for the changed project as outlined in the DOEMP include:

- undertaking a pre-construction fauna survey within and around worksites to identify any species for which a species management plan needs to be developed
- minimise disturbance to significant vegetation and habitat during construction
- ensure a qualified fauna spotter/catcher is present prior to and during the removal of any habitat trees to capture and relocate any disturbed fauna. The spotter must be registered with EHP
- prepare and implement landscape and rehabilitation plans to include investigation of opportunities for improvements to habitat as a result of the project works
- fauna management plan.

5.12.4. Coordinator-General's conclusion

I am satisfied that the proponent has assessed the changes to the potential impacts to flora and fauna for the changed project, and that the implementation of the mitigation measures outlined in the DOEMP would adequately manage and mitigate the potential impacts. To ensure this, I have imposed a condition (Appendix 1) which requires the proponent to submit to me for approval the OEMP. This will include an outline of the Construction and Commissioning EMP's mitigation and management measures for nature conservation impacts.

5.13. Spoil management and waste

This section discusses the changes to spoil management and waste generated from the changed project, which generally result from the shorter tunnel alignment and change in station designs.

The key spoil management changes to the project are:

- reduction of the quantity of spoil generated from 1.4 Mm^3 to 0.97 Mm^3 due to the shortened tunnel length and other alignment amendments
- change to location of spoil placement from one site at Swanbank to five potential sites being:
  - Brisbane Airport
  - Swanbank, Swanbank Road
  - Pine Mountain, Pine Mountain Road
  - Larapinta, Paradise Road

  - Port of Brisbane, Port Drive
- Reduction in the quantity of spoil as a result of the shortened alignment.

5.13.1. Submissions received

The key spoil management issues raised in submissions on the changed project include:

- spoil placement at the Larapinta site would conflict with the objectives of the Oxley Creek Transformation project
- the potential requirement for a sales permit under the *Forestry Act 1959*
- having five potential spoil placement sites creates uncertainty and risk for spoil haulage.

Additional submissions were raised relating to the spoil handling and haulage routes which are discussed in Section 5.4 (traffic and transport).

I have considered each submission and how the information provided by the proponent has responded to the submitter issues as part of my evaluation below.

5.13.2. Impacts and mitigation

Construction impacts

Consistent with the project, the changed project will have four main activities that generate spoil and waste material during construction, including:

- spoil material from tunnel and dive excavation
- demolition and construction waste associated with the tunnel and stations
- liquid waste from the treatment of groundwater and wash-down activities
- general solid waste (for example general office waste generated by site staff, visitors and other personnel)

Due to the shortening of the alignment and revised station designs, the quantity of spoil generated by the changed project has reduced from 1,400,000m³ to 976,000m³. The main spoil removal locations for the changed project are Woolloongabba and Boggo Road Railway Stations. The estimated change in spoil quantities are shown in Table 5.7.

Table 5.7 Estimated change in spoil quantity[23]

Worksite location	The project (m³)	Changed project (m³)
Southern portal	Yeerongpilly: 375,000 Ventilation shaft/building 11,500	Near Dutton Park Railway Station: 39,000
Boggo Road Railway Station	155,000	119,000
Woolloongabba Railway Station	437,000	470,000

[23] Source: Request for Project Change – Volume 1, February 2017

Albert Railway Street Station	190,000	135,000
Roma Railway Street Station	161,000	112,000
Northern portal	96,000 (Victoria Park)	65,000 (Exhibition Line Corridor)
Mayne Rail Yard	-	36,000
Total	**1,400,000m³**	**976,000m³**

Potential spoil placement locations

The project identified one spoil disposal placement site, being the Swanbank site and the Commonwealth Department of the Environment and Energy deemed the action not a controlled action. As five potential sites are now proposed, the proponent will be required to further consult with the Commonwealth Department of the Environment and Energy, key state agencies and local councils.

The five potential disposal sites identified in the changed application are:

- Brisbane Airport—landside development site identified in the Brisbane Airport Masterplan for general industry use
- Swanbank, Swanbank Road—an area used for waste disposal for the last 20 years originating from exhausted open cut coal mines
- Pine Mountain, Pine Mountain Road—former quarry intended to be rehabilitated
- Larapinta, Paradise Road—sites previously used for sand extraction from the floodplain for Oxley Creek which pits are currently open and if used, could be rehabilitated
- Port of Brisbane, Port Drive—site identified for future expansion and currently subject to approved ongoing reclamation works.

These sites have been identified on general availability, capacity to accept the required volume of spoil, haul route length and proximity to sensitive receptors. The proponent has advised that not all of these sites will be used for spoil placement. Contingency plans will be developed to cater for changing commercial or environmental drivers that may occur when agreements are developed with the waste disposal providers following the detail design stage.

Due to the absence of detail on each placement site for the changed project, the approval to use the spoil sites, including any Commonwealth approvals for placement of spoil, will not be sought as part of the current environmental assessment. Where required, approvals would be sought by the relevant entity prior to commencement of construction.

Contaminated or unsuitable spoil material which cannot be used for spoil placement will be disposed of at an appropriately licenced landfill, which may be different to the sites identified above. For details on spoilage haulage, see Section 5.4 (traffic and transport).

Operation impacts

The operational waste generated by the changed project will be less than the construction waste and dependent on the rail network operation and maintenance

regimes for the trains and stations. Operational waste is not anticipated to be greater than that of the project and waste types will generally be consistent with those already mentioned including:

- liquid waste
- regulated waste
- general soil waste
- green waste.

Waste will be managed in accordance with the Rail Infrastructure Manager, TMR's procedures and statutory requirements and as part of the existing rail network.

Mitigation and management measures

The proponent proposes the following additional mitigation measures as outlined in the DOEMP:

- management of hazardous material and dangerous goods through use of a hazardous goods management plan
- water captured by the drainage system at each of the stations and portals, will either be transferred to a local treatment plant prior discharge at an approved point or at a lawful point of discharge.
- implementing measures for the removal and disposal of sulphur hexafluoride in accordance with the requirements of the Energy Networks Associated Industry Guideline ENA Doc 022.2008 – Industry Guideline for SF6 Management.
- the recovery targets established by the *Queensland Waste Avoidance and Resource Productivity Strategy (2014-2024) – Everyone's Responsibility* will be incorporated into the Waste and Resource Recovery Management plan (WRRMP).

The proponent has committed to preparing a WRRMP, through the DOEMP, which will be implemented to address waste management. The WRRMP will include the following:

- targets for recovering and re-using construction waste (including demolition)
- all reasonable and practicable steps to minimise the impacts of handling and disposal of construction waste at worksites and disposal sites
- incident management procedures
- arrangements for decommissioning construction worksites
- compliance with the waste management hierarchy and *Waste – Everyone's Responsibility* (Queensland Waste Avoidance and Resource Productivity Strategy (2014-2024)
- compliance with the waste management procedures for all phases of construction and waste material types (e.g. demolition and handling and disposal of asbestos)

The proponent has committed, through the DOEMP, to preparing and implementing a hazardous goods management plan which will be prepared in consultation with Workplace Health and Safety Queensland, and a spoil placement management plan. I expect that the mitigation and management measures outlined in the project's DOEMP are fully implemented

5.13.3. Coordinator-General's conclusion

I consider the predicted environmental impacts of waste generated by project activities of the changed project are similar or reduced to those expected for the project.

The project concluded that the waste and resource recovery activities are not expected to pose a significant risk to the environment or public health. Provided effective waste management and resource activity control measures are implemented for the changed project, I do not consider there to be an additional risk.

I am satisfied that construction and operation impacts from waste will be managed through the OEMP and relevant management plans. I require the OEMP to be submitted to me for approval through the imposed conditions (Appendix 1) and I am satisfied this approach will adequately manage waste impacts as a result of the changed project.

6. Conclusion

This report concludes my evaluation of the proposed project change pursuant to section 35I of the SDPWO Act.

I am satisfied that the requirements of the SDPWO Act have been met and that sufficient information has been provided to enable the evaluation of the project change and the amendment of conditions of approval.

I consider that the changes to the project and the amended conditions imposed in this report would result in acceptable overall outcomes. The changes to the project would result in less overall impacts than the project.

Accordingly, I approve the changes to the Cross River Rail project as set out in the change application, subject to the conditions in Appendix 1. I have also made recommendations in Appendix 2 for the proponent.

In accordance with section 35K of the SDPWO Act, the Coordinator-General's report on the EIS for the project, and the Coordinator-General's change report, both have effect for the project. However, if the reports conflict, the Coordinator-General's change report prevails to the extent of the inconsistency. The proponent must implement all conditions in this report.

This report and all conditions and requirements contained within it, remain current for a period of three years.

A copy of this report will be issued to:

- the proponent
- TMR

A copy of this report and all relevant EIS assessment documentation are available on the Department of State Development's website at **www.statedevelopment.qld.gov.au/crr**

Appendix 1. Imposed conditions

This appendix includes conditions imposed by the Coordinator-General under section 54B of the SDPWO Act.

All of the conditions imposed in this appendix take effect from the date of this Coordinator-General's report.

These conditions do not relieve the proponent of the obligation to obtain all approvals and licences from all relevant authorities required under any other Act.

In accordance with section 54B(3) of the SDPWO Act, I have nominated entities to have jurisdiction for the imposed conditions for the project in Schedule 2.

Pursuant to section 54D of the SDPWO Act, these conditions apply to anyone who undertakes the project, such as the proponent and an agent, contractor, subcontractor or licensee of the Proponent.

Defined terms that are part of the imposed conditions are contained in Schedule 3.

Part A. Imposed Conditions (General)

Condition 1. General conditions

(a) The project must be carried out generally in accordance with the Cross River Rail Request for Project Change dated February 2017, including the amended Volume 3 Design Drawings publicly notified in April 2017.

(b) The proponent must notify the Coordinator-General and all nominated entities in Schedule 2 in writing of the commencement of Project Works and the commencement of the commissioning and operational phases of each 'construction site' at least 20 business days prior to the relevant commencement date.

Condition 2. Outline Environmental Management Plan

(a) Six months prior to the commencement of Project Work submit a final Outline Environmental Management Plan to the Coordinator-General for approval.

(b) The Outline Environmental Management Plan must:

- (i) Include the environment outcomes and performance criteria for each environmental element from the draft outline EMP except as amended by these conditions;
- (ii) include possible mitigation measures, monitoring and reporting for each environmental element to achieve the environmental outcomes;
- (iii) include an outline of:
  - (A) the Construction Environmental Management Plan
  - (B) the Commissioning Environmental Management Plan
- (iv) be consistent with the Environmental Design Requirements in Schedule 1
- (v) include the following sub-plans:
  - (A) Community and Stakeholder Engagement Plan

(B) Construction Worksite Management Plan

(C) Construction Traffic Management Plan (CTMP)

(D) Construction Vehicle Management Plan

(E) Water Quality Monitoring Plan

(F) Erosion and Sediment Control Plan

(G) Spoil Placement Management Plan

(H) Noise and Vibration Management Plan

(I) Air Quality Management Plan

(J) Settlement Management Plan

(K) Non-Indigenous Cultural Heritage Management Plan

(L) Indigenous Cultural Heritage Management Plan

(vi) Be made available on the proponent's website once approved by the Coordinator-General and for the duration of the construction of the project and for a period of five years from commencement of operation.

Part B. Imposed Conditions (Design)

Condition 3. Design

(a) The project must achieve the Environmental Design Requirements in Schedule 1.

Part C. Imposed Conditions (Construction)

Condition 4. Construction Environmental Management Plan

(a) Prior to the commencement of Project Work, a Construction Environmental Management Plan for those works (Relevant Project Work) must be developed by the Proponent and endorsed by the Environmental Monitor as being consistent with the Outline EMP and these imposed conditions.

(b) The endorsed Construction Environmental Management Plan must be submitted to the Coordinator General at least 20 business days prior to the commencement of Relevant Project Works.

(c) The Construction Environmental Management Plan must:

(i) describe the Relevant Project Work;

(ii) be based on predictive studies and assessments of construction impacts which have regard to the scale, intensity, location and duration of construction works, and location of Directly Affected Persons;

(iii) be generally consistent with the Outline EMP and incorporate its environmental outcomes and performance criteria;

(iv) incorporate and respond to the Imposed Conditions (Construction);

(v) demonstrate that the Imposed Conditions (Construction) will be complied with during Relevant Project Work;

(vi) incorporate the community engagement plan, including the complaints management process, in accordance with Condition 9;

(vii) where predictive studies indicate impacts beyond those provided for in the performance criteria, incorporate mitigation measures to achieve the environmental outcomes;

(viii) establish specific mitigation measures and processes for consultation with Directly Affected Persons for Project Works under Conditions 9(c), 11(c), and 11(e);

(ix) contain a program and procedures for ongoing monitoring to identify the effectiveness of mitigation measures in achieving the Imposed Conditions (Construction) and the environmental outcomes in (iii)

(x) include a process for regular review and if required updating of the Construction Environmental Management Plan, including a process to review and implement additional or different mitigation measures in response to monitoring results;

(xi) incorporate the EMP sub-plans required by the Imposed Conditions or as required by the approved Outline EMP.

(d) The Construction Environmental Management Plan must be implemented for the duration of Relevant Project Work.

(e) Relevant Project Work is authorised if it is undertaken in accordance with the Construction Environmental Management Plan.

(f) The Construction Environmental Management Plan must be publicly available on the project website for the duration of the construction phase.

(g) The Construction Environmental Management Plan may be updated.

(i) updates to the Construction Environmental Management Plan that include new or additional Relevant Project Work must be endorsed by the Environmental Monitor as being consistent with condition 2 before Relevant Project Work may proceed.

(h) Updates to the Construction Environmental Management Plan that are limited to new or different mitigation measures for Managed Work may be endorsed by the Environmental Monitor.

Condition 5. Compliance

(a) The proponent must notify the Environmental Monitor and the Coordinator-General in writing, within 48 hours after becoming aware of a Non-Compliance Event.

(b) The notification must include:

(i) a description of the Non-Compliance Event, including details of the location, date and time of the Non-Compliance Event;

(ii) the name and contact details of a designated contact person;

(iii) an outline of actions that have been or will be taken to respond to the Non-Compliance Event.

(c) Within 14 days following the notification of a Non-Compliance Event, written advice detailing the following information must be provided to the Environmental Monitor and the Coordinator-General:

(i) a description of the Non-Compliance Event, including details of the location, date and time of the Non-Compliance Event;

(ii) the name and contact details of a designated contact person;

(iii) the circumstances in which the Non-Compliance Event occurred;

(iv) details of any complaint in relation to the Non-Compliance Event;

(v) the cause of the Non-Compliance Event;

(vi) a description of the environmental effects of the Non-Compliance Event;

(vii) the results of any sampling or monitoring performed in relation to the Non-Compliance Event;

(viii) actions taken to mitigate the environmental effects of the Non-Compliance Event;

(ix) proposed actions to prevent a recurrence of the Non-Compliance Event, including timing and responsibility for implementation.

(d) The Non-Compliance Event report must be made available on the project website and remain available for the duration of the construction phase for the project.

Condition 6. Reporting

(a) The Proponent must prepare a Monthly Report that summarises compliance and monitoring results for the duration of construction works.

(b) The Monthly Report must include:

(i) monitoring data required by the imposed conditions or Construction Environmental Management Plan undertaken for the period and, where required, an interpretation of the results;

(ii) details of any Non-Compliance Event, including a description of the incident, resulting effects, corrective actions, revised construction practices to prevent a recurrence, responsibility and timing;

(iii) reporting of complaints, including the number of complaints, description of issues, responses and corrective actions.

(c) The Monthly Report must be provided to the Coordinator-General and the Environmental Monitor, and made available on the project website within one week of the end of the month to which the report relates, and continue to be available on the project website until commissioning is complete.

(d) The Proponent must provide annual reports to the Coordinator-General and the Environmental Monitor (Annual Report) no later than 31 July in any year during the construction phase about compliance with the imposed conditions.

(e) The Annual Report must include:

(i) a compliance evaluation table detailing the relevant imposed condition, whether compliance with the condition was achieved and how compliance was evaluated

(ii) an evaluation of compliance in relation to the CEMP and its sub-plans;

(iii) a summary of any Non-Compliance Events during the reporting period;

(iv) a summary of any Non-Compliance Events during the previous reporting period, with details of site remediation activities, corrective actions taken or

to be taken and revised practices implemented or to be implemented (as relevant).

Condition 7. Environmental Monitor

(a) The Proponent must engage an independent, appropriately skilled and experienced entity, approved by the Coordinator-General, as the Environmental Monitor for the duration of construction.

(b) The Proponent must ensure that the Environmental Monitor has reasonable site access and access to all information required to perform its function, including, without limitation:

  (i) all approvals;

  (ii) the Construction Environmental Management Plan;

  (iii) results of all monitoring required under the Imposed Conditions (Construction) including through the Construction Environmental Management Plan;

  (iv) all information relating to complaints, including access to the complaints database.

(c) The Environmental Monitor must:

  (i) monitor compliance with the imposed conditions during the construction of the project;

  (ii) monitor compliance with the Construction Environmental Management Plan and sub-plans;

  (iii) maintain a register of mitigation measures agreed between the Proponent and Directly Affected Persons (Mitigation Register);

  (iv) review the compliance reports required by Condition 5, and the monthly reports and annual reports required by Condition 6, and provide advice to the Coordinator-General and the Proponent on the contents and adequacy of those reports;

  (v) review the results of monitoring, which may be verified by the Environmental Monitor including by independent monitoring;

  (vi) provide advice to the Proponent about compliance with the Imposed Conditions for construction, including by providing the results of independent monitoring where required;

  (vii) provide advice to the Proponent about issues raised in complaints and the response to complaints, including advice from the Community Relations Monitor;

  (viii) endorse the Construction Environmental Management Plan as consistent with the Outline EMP and complying with the Imposed Conditions (Construction);

Condition 8. Community Relations Monitor

(a) The proponent must engage an independent, appropriately skilled and experienced entity, approved by the Coordinator-General, as the Community Relations Monitor for the duration of construction.

(b) The Community Relations Monitor must:

(i) review and provide advice to the Environmental Monitor on the community engagement plan required by Condition 9;

(ii) receive monthly reports from the proponent on complaints;

(iii) attend each meeting between the Proponent and a Directly Affected Person to consult on mitigation measures, including providing input on standard responses for similar impacts;

(iv) provide advice to the Environmental Monitor in relation to complaints, community engagement and consultation on mitigation measures;

(v) be available to members of the community in accordance with Condition 9(f)(vi).

Condition 9. Community engagement plan

(a) The Proponent must develop a community engagement plan as part of the Construction Environmental Management Plan consistent with the Outline EMP's Community and Stakeholder Engagement Plan.

(b) The community engagement plan must be given to the Community Relations Monitor for advice at least 10 business days prior to the Construction Environmental Management Plan being provided to the Environmental Monitor.

(c) The community engagement plan must provide for:

(i) Directly Affected Persons to be consulted prior to commencement of Project Works and ongoing thereafter about Project Works, predicted impacts and mitigation measures;

(ii) Directly Affected Persons to be consulted about possible mitigation measures;

(iii) local communities near Project Works to be informed about the nature of construction, including the timing, duration and predicted impacts of the works in advance of their commencement;

(iv) information to be provided to public transport, road users, pedestrians and cyclists about the predicted effects of Project Works on road, rail and pedestrian and cycle network operations, in advance of their commencement;

(v) specific community consultation plans for identified key stakeholders;

(vi) implementation of an Indigenous employment policy, providing for Indigenous training and employment opportunities;

(vii) a process for advance notification to local communities of Project Works, including the timing, duration, predicted impacts and mitigation measures, which is available on the project website and through other media.

(d) The community engagement plan must incorporate a complaints management system developed specifically for the Project, which is established prior to the commencement of Project Works.

(e) The complaints management system must deliver a prompt response to community concerns with relevant information, action where required, and reporting of incidents.

(f) As a minimum, the complaints management system must include the following elements:

(i) a procedure for receiving complaints on a 24 hour, seven days a week basis, during Project Works;

(ii) a mechanism for notifying the community of the complaints procedure and how it may be accessed;

(iii) a process for registering and handling complaints received, including a database for tracking of complaints and actions taken in response;

(iv) a procedure for verifying complaints through monitoring and detailed investigation, and escalating and resolving verified complaints;

(v) a procedure for complaints to be notified to the Community Relations Monitor, including information about the complaint and its resolution;

(vi) access by the community to the Community Relations Monitor; and

(vii) regular reporting via the monthly environmental report, to the community of complaints and corrective actions, maintaining appropriate confidentiality.

(g) All information regarding complaints, including the information collected in Condition 9(f)(iii) must be made available to the Community Relations Monitor.

Condition 10. Hours of work

(a) Surface works for the Project are authorised to be undertaken within the hours of work set out in Table 1.

Table 1. Construction hours

Worksite	Surface works—standard hours	Extended work hours	Managed Work	Spoil haulage and materials/ equipment delivery
Southern portal	Monday to Saturday, 6.30am-6.30pm	For approved rail possession—80 hrs continuous work (Other extended work) 6:30pm - 10:00pm, Monday to Friday	24 hrs, 7 days	24 hours, 7 days
Boggo Road Railway Station	Monday to Saturday, 6.30am-6.30pm	For approved rail possession—80 hrs continuous work (Other extended work) Monday to Friday 6:30pm - 10:00pm,	24 hrs, 7 days	Monday to Friday: 6.30am - 7.30am 9.00am - 2.30pm 4.30pm - 6.30pm Saturday 6.30am - 6.30pm
Dutton Park Railway Station (track connection)	Monday to Saturday, 6.30am-6.30pm	For approved rail possession—80 hrs continuous work	n/a	24 hours, 7 days, except for: Monday to Friday: 7:00am - 9:00am 4:30pm - 6:30pm
Woolloongabba Railway Station	Monday to Saturday,	Monday to Friday 6:30pm- 10:00pm	24 hrs,	24 hours, 7 days, except for:

	6.30am- 6.30pm		7 days	Monday to Friday: 7:00am - 9:00am 4:30pm - 6:30pm
Albert Street Railway Station	Monday to Saturday 6.30 am – 6.30 pm,	Monday to Friday 6.30 pm – 10.00 pm	24 hours, 7 days	Monday to Friday: 6.30 am – 10.00 pm Saturday 6:30am - 6:30pm
Roma Street Railway Station	Monday to Saturday, 6.30am- 6.30pm	Monday to Friday 6:30pm- 10:00pm	24 hrs, 7 days	Monday to Friday 6.30am - 7.30am 9.00am - 4.30pm 6.30pm - 10:00pm Saturday 6.30am - 6.30pm
Northern portal	Monday to Saturday, 6.30am- 6.30pm	For approved rail possession—80 hrs continuous work (Other extended work) Monday to Friday 6:30pm - 10:00pm,	24 hrs, 7 days	Monday to Friday: 6.30 am – 10.00 pm Saturday 6:30am - 6:30pm
Exhibition Railway Station	Monday to Saturday, 6.30am- 6.30pm		24 hours, 7 days	Monday to Saturday: 6:30am - 6:30pm
Mayne Railway Yard	Monday to Saturday, 6.30am- 6.30pm		24 hours, 7 days	24 hours, 7 days

(b) Project Works that are underground, or in a ventilated acoustic enclosure, may be undertaken at any time provided the environmental outcomes are achieved.

(c) Works carried out because of an emergency that:

(i) is endangering the life or health of a person; or

(ii) is endangering the structural safety of a building; or

(iii) is endangering the operation or safety of community infrastructure that is not a building; or

(iv) is required to prevent environmental harm,

may be undertaken outside the hours set out in Table 1.

(d) The following work may be undertaken during Extended Work Hours as set out in Table 1. subject to compliance with a specific Construction Environmental Management Plan sub-plan in accordance with Condition 4:

(i) Project Works within rail corridor land;

(ii) Project Works within a road reserve or busway that cannot be undertaken reasonably nor practicably during standard hours due to potential disruptions to peak traffic flows or bus operations;

(iii) Project Works involving the transport, assembly or decommissioning of oversized plant, equipment, components or structures;

(iv) delivery of "in time" materials such as concrete, hazardous materials, large components and machinery;

(v) Project Works that require continuous construction support, such as continuous concrete pours, pipe-jacking or other forms of ground support necessary to avoid a failure or construction incident.

(e) Blasting must not occur on public holidays, and is only authorised to occur during the hours of 7:30am to 4:30pm Monday to Saturday, and not on Sundays or public holidays.

(f) Prior to blasting events, at least 48 hours' notice must be provided to persons who may be adversely affected.

Condition 11. Construction Noise and Vibration

(a) Project Works must aim to achieve the project noise goals for human health and well-being presented in Table 2.

Table 2. Noise goals (internal) for Project Works

	Monday – Saturday 6.30am – 6.30pm	**Monday – Friday 6.30pm – 10.00pm (Gabba, CBD only)**	**Monday – Saturday 6.30pm – 6.30am Sundays, Public Holidays**	**For Blasting Monday – Saturday 7.30 am – 4:30 pm only**
Continuous ($LA_{eq\ adj}$)(1hr)	AS 2107 Maximum design level	40 dBA $LA_{eq\ adj\ (1hr)}$	35 dBA $LA_{eq\ adj\ (1hr)}$	130 dB Linear Peak
Intermittent ($LA_{10\ adj}$)(15min)	AS 2107 Maximum design level + 10 dBA	50 dBA $LA_{10,\ adj}$	42 dBA $LA_{10\ adj}$	

Notes

1. All goals are internal noise levels for human health and well-being outcomes.
2. Where internal noise levels are unable to be measured or monitored, the typical noise reductions presented in Guideline Planning for Noise Control, Ecoaccess, DEHP, January 2016 apply.

(b) During construction monitor and report on noise and vibration in accordance with the Noise and Vibration Management Plan, a sub-plan of the Construction Environmental Management Plan.

(c) Project Works predicted to or monitored as generating noise levels more than 20dBA ($LA_{eq\ 10min,\ adj}$) above the relevant goal in Table 2. are authorised to occur in a locality only:

(i) when advance notification and consultation has been undertaken with Directly Affected Persons or potentially Directly Affected Persons about the particular predicted impacts and the approach to mitigation of such impacts;

(ii) where mitigation measures addressing the particular predicted or measured impacts have been developed on a 'case by case' basis in consultation with Directly Affected Persons;

(iii) where the mitigation measures are incorporated in a mitigation register and implemented prior to undertaking the Project Works;

(iv) between the hours 7:00am to 6:00pm Monday to Friday, with a respite period between 12:00noon and 2:00pm each day;

(d) Project Works must aim to achieve the construction vibration goals in Table 3.

Table 3. The construction vibration goals

Receiver type	Cosmetic Damage			Human comfort (mm/s PPV)		Sensitive building contents (mms/PPV)
	Continuous vibration (mm/s PPV)	**Transient vibration (mm/s PPV)**	**Blasting vibration (mm/s PPV)**	**Day**	**Night**	
Residential	According to BS7385 reduced by 50%[4]	According to BS7385	50[1]	According to AS2670	0.5[2]	
Commercial	According to BS7385 reduced by 50%[4]	According to BS7385	50	According to AS2670	-	0.5[3]
Heritage structures	2	-	10	-	-	

Notes:

1. All residential receivers in the vicinity of the Project blasting sites are regarded as reinforced or framed structures (i.e. BS7385)
2. Residential sleep disturbance
3. Equipment specific vibration criteria are required for highly sensitive equipment (i.e. electron microscopes, MRI systems or similar), as part of future site-specific detailed investigations
4. If resonance is present, or if investigation to detect resonance were not able to be undertaken due to a lack of access

(e) Where vibration protection criteria are available for sensitive building contents, predictive modelling must take into account the manufacturer's specifications for tolerance to vibration. To the extent reasonable and practicable, those specifications apply in lieu of the construction vibration goals in Table 3. Where predictive modelling indicates the specified criteria would not be achieved by the Project Works, such works may proceed only in accordance with specific mitigation measures agreed with the potentially Directly Affected Persons.

(f) Project Works predicted to or monitored as generating vibration levels more than 2mm/s for continuous vibration and 10mm/s for transient vibration may occur only:

(i) between the hours 7:00am to 6:00pm Monday to Friday, with a respite period between 12:00noon and 2:00pm each day; or

(ii) in accordance with the mitigation measures developed in consultation with and agreed by Directly Affected Persons that are incorporated in the Mitigation Register.

Condition 12. Property Damage

(a) Prior to the commencement of Project Works, predictive modelling must be undertaken of potential ground movement that may be caused by the Project Works. Such predictive modelling must ascertain the potential for damage due to ground movement being caused to property by Project Works.

(b) Where predictive modelling indicates the Project Works would lead to impacts above the vibration goals for cosmetic damage in Table 3. the proponent must prepare and submit a property damage sub-plan, prior to the commencement of such works, as part of the Construction Environmental Management Plan. The property damage sub-plan must set out the procedure for:

(i) advance communication with potentially Directly Affected Persons;

(ii) procedures for building condition surveys both in advance of and following Project Works, including provision for consultation with property owners and occupants;

(iii) monitoring to be undertaken for potential impacts to property; and

(iv) mitigation measures.

(c) Where a post-construction building condition survey identifies that property damage has occurred as a consequence of the Project Works, such damage must be repaired as soon as practicable by the Proponent at no cost to the property owners. Such repairs must be undertaken in consultation with the property owners and occupants and must return the premises at least to the condition existing prior to commencement of Project Works. The Proponent must agree the timing, method and extent of works required with the affected landowner and must gain permission to undertake such reparation works prior to their commencement.

Condition 13. Air quality

(a) Project Works must aim to achieve the goals in Table 4.

Table 4. Air quality criteria and goals

Criterion	Air quality indicator	Goal	Averaging period
Human Health	Total Suspended Particulates (TSP)	90 µg/m^3	1 year
	Particulate matter ((PM_{10})[1]	50 µg/m^3	24 hours
		25 µg/m^3	1 year
Nuisance	TSP[2]	80 µg/m^3	24 hours
	Deposited dust[3]	120 mg/m^2/day	30 days

(b) During construction monitor and report on air quality in accordance with the Air Quality Management Plan, a sub-plan of the Construction Environmental Management Plan.

Condition 14. Traffic and transport

(a) Project construction traffic must be managed to avoid or minimise adverse impacts on road safety and traffic flow, public transport, freight rail movements, pedestrian and cyclist safety, and property access.

(b) During construction workforce car parking must be provided and managed to avoid workforce parking on local streets.

(c) Access for emergency services to project worksites and adjoining properties must be maintained throughout the construction phase.

(d) Practicable access is maintained to adjacent properties throughout the construction phase.

(e) Heavy construction vehicles use only designated routes for spoil haulage and deliveries of major plant, equipment and materials, in accordance with the Construction Environmental Management Plan. The designated haulage routes for each worksite must follow major or arterial roads to the extent practicable and be developed in consultation with the Department of Transport and Main Roads and the Brisbane City Council in preparation of the Construction Environmental Management Plan.

(f) The Outline Environmental Management Plan must be supported by a road safety assessment for the spoil haulage route.

(g) Construction traffic must operate within the requirements of a construction traffic management sub-plan (Construction Traffic Management Plan) incorporated within the Construction Environmental Management Plan.

(h) The Construction Traffic Management Plan must include:

  (i) the proposed access to worksites, with local or minor roads only used where unavoidable to access a project worksite;

(ii) a process for advance notice to Directly Affected Persons and local communities within the vicinity of the spoil haulage routes and worksite accesses;

(iii) local traffic management measures developed in consultation with Brisbane City Council for key intersections:

(A) in Bowen Hills including Bowen Bridge Road, College Road and O'Connell Terrace;

(B) in the CBD including Albert Street, Charlotte Street, Elizabeth Street and Roma Street;

(C) at Woolloongabba including Leopard Street, Stanley Street, Vulture Street and Main Street;

(D) at Dutton Park including Annerley Road, Peter Doherty Street, Joe Baker Street and Boggo Road, as well as Kent Street, Cornwall Street and Ipswich Road.

(iv) specific traffic management measures developed in consultation with other key stakeholders, including:

(A) the department administering the *Economic Development Act 2012* with regards traffic management in the Queens Wharf Brisbane priority development area;

(B) Queensland Rail about maintaining access to railway stations; and

(C) the department administering the *Transport Infrastructure Act 1994* and the Brisbane City Council about maintaining operations for bus services along streets affected by the Project Works.

(i) Project Works must be designed, planned and implemented to maintain acceptable footpath and cycle paths in areas adjacent to project worksites in terms of capacity, legibility and pavement condition. The proponent must consult with the Brisbane City Council and Queensland Rail about changes in pedestrian and cycle paths required to facilitate Project Works.

Condition 15. Water quality

(a) Discharge of surface water and groundwater from Project Works must comply with the Brisbane River Estuary environmental values and water quality objectives (Basin no. 143 - mid-estuary) in the Environmental Protection (Water) Policy 2009.

(b) During construction monitor and report on water quality in accordance with the Water Quality Management Plan, a sub-plan of the Construction Environmental Management Plan.

Condition 16. Water resources

(a) Prior to the commencement of Project Works involving excavation, the Proponent must undertake predictive modelling of the potential for groundwater drawdown. The predictive modelling must be based on validated monitoring data and must address the likely extent of any drawdown over time, up to the time when such movement reaches equilibrium.

(b) Project Works must be designed, planned and implemented to avoid where practicable and otherwise minimise the inflow of groundwater to the Project Works, including excavations, the underground stations and tunnels, having regard for the predictive modelling.

(c) The Proponent must monitor the inflow of groundwater to the Project Works and compare monitoring data with the predictive modelling. If the rate of groundwater inflow rate exceeds 1L/sec in any worksite, the proponent must revise work methods and devise and implement mitigation measures as soon as practicable.

Condition 17. Surface water

(a) Project Works, and worksites, must be designed and implemented to avoid inundation from stormwater due to a 2 year (4hr) ARI rainfall event and flood waters due to a 5 year ARI rainfall event.

(b) Project works must be designed and implemented to avoid afflux or cause the redirection of uncontrolled surface water flows, including stormwater flows, outside of worksites.

Condition 18. Erosion and sediment control

(a) An erosion and sediment control sub-plan that is consistent with the Guidelines for Best Practice Erosion and Sediment Control (International Erosion Control Association, 2008) and the Department of Transport and Main Roads' Technical Standard MRTS51 – Environmental Management must be submitted as part of the Construction Environmental Management Plan.

Condition 19. Acid sulphate soils

(a) Acid sulphate soils must be managed in accordance with the methods and requirements of the latest edition of the *Queensland Acid Sulphate Soil Technical Manual*.

Condition 20. Landscape and open space

(a) Project Works are designed and implemented to minimise impacts on landscape and open space values.

(b) Project works and worksites in Victoria Park must be designed, planned and implemented to avoid, or minimise the loss of trees and ornamental plantings, and must minimise the area of the park directly impacted during such works.

(c) Worksites in Victoria Park must be enclosed with a visually solid screen and any night lighting including security lighting must be situated to minimise the spill of light beyond the worksite enclosures.

(d) Existing pathways and recreational facilities in Victoria Park must be relocated within the park for the duration of the works, in consultation with the Brisbane City Council. Upon completion of the project works, such pathways and facilities must be re-established in locations in the park in consultation with the Brisbane City Council.

Condition 21. Worksite rehabilitation

(a) Worksites for project infrastructure, such as the surface connections, stations and ancillary buildings must be rehabilitated as soon as practicable upon completion of the works.

(b) All other worksites required to support commissioning activities must be rehabilitated as soon as practicable on completion of commissioning or sooner where possible.

(c) Rehabilitation must address soil erosion and sedimentation, dust nuisance and landscape and visual impact.

(d) Any planting, landscaping and streetscape works undertaken as part of rehabilitation must be undertaken in accordance with landscape and urban design plans prepared in consultation with the Brisbane City Council.

Part D. Imposed Conditions (Commissioning)

Condition 22. Environmental design requirements

(a) The Proponent must conduct such testing and monitoring as is necessary to demonstrate that the Environmental Design Requirements in Schedule 1 have been satisfied.

(b) At the completion of Commissioning, the Proponent must give written notice to the Coordinator-General that the Project has achieved the Environmental Design Requirements in Schedule 1.

Condition 23. Commissioning

(a) Commissioning may be carried out in stages.

(b) Testing for commissioning must be supported by advanced notice to local residents and businesses.

(c) Testing for commissioning must not cause an exceedance of the goals in Table 2, Table 3, Table 4 or Condition 15.

Schedule 1. Environmental Design Requirements

1. Traffic and transport

(a) Emergency access and evacuation for each station and the tunnel is designed in consultation with the Emergency Service Authorities.

(b) Station plazas and forecourts are of a sufficient size and dimension to avoid peak pedestrian flows spilling onto adjacent carriageways. Where the overflow of pedestrians onto carriageways cannot be avoided, local traffic management measures addressing such circumstances must be designed and implemented prior to the commencement of Project operations.

(c) Pedestrian and cycle pathways in the vicinity of stations are designed in accordance with Rail Infrastructure Manager's and TMR's requirements.

(d) The design of driveways and roadworks for the Project avoid conflicts between construction traffic and cyclists and pedestrians.

(e) New footpaths, pedestrian walkways and pedestrian road crossings in the vicinity of stations are designed, in consultation with BCC and emergency services authorities, to allow safe and efficient pedestrian movement during peak periods and, where applicable, major events at the Brisbane Cricket Ground Woolloongabba Station), Lang Park (Roma Street Station) and the RNA Showgrounds (Exhibition Station).

(f) The Project design provides for pedestrian connectivity between the PA Hospital, Boggo Road Busway Station and Park Road Railway Station, and incorporates appropriate crime prevention through environmental design (CPTED) principles and Disability Discrimination Act 1992 (DDA) compliant vertical transport facilities.

2. Air Quality

(a) Ventilation outlets from underground stations are designed and sited so as not to cause an increase in air temperature of more than one degree Celsius, measured as an hourly average, or concentrations of ambient air contaminants that exceed air quality objectives.

(b) The Project is designed so that it does not cause the air quality objectives specified in Table 5 to be exceeded.

(c) The ventilation outlets are designed to avoid discharging directly into an air intake for any other ventilation or air conditioning system that is in place at the time of detailed design and construction of the relevant ventilation outlet.

Table 5. Ambient air quality outcomes

Pollutant	Air Quality Objective	Average Period
Total Suspended Particulates (TSP)	90 µg/m^3	Annual
Particulates as PM10 (<10 µm)	50 µg/m^3	24 hours
	25 µg/m^3	Annual

3. Noise and Vibration

(a) Where practicable, the Project is designed to achieve the following noise criteria for railway surface track airborne noise emissions:

  (i) 65 dBA, evaluated as the 24 hour average equivalent continuous A-weighted sound pressure level;

  (ii) 87 dBA, evaluated as a Single Event Maximum sound pressure level.

(b) Where practicable, the Project is designed to achieve the goals for ground-borne noise provided in Table 6 and for vibration provided in Table 7.

(c) Ventilation systems, mechanical plant, and electricity feeder stations at or near stations are designed and sited to operate within the noise goals outlined in Table 8.

Table 6. Ground-borne noise design criteria (rail operations)

Receiver	Time of day	Internal noise design criteriod (dBA)
Residential	07:00-22:00	40dBA
	22:00-07:00	35dBA
Schools, educational institutions, places of worship.	When in use	40dBA to 45dBA
Retail areas	When in use	50dBA to 55dBA
General office areas	When in use	45dBA
Private offices and conference rooms	When in use	40dBA
Theatres	When in use	35dBA

Table 7. Ground-borne vibration design criteria (rail operations)

Receiver type	Period	Vibration goal (vibration velocity)
Residential	Day/ night	106dBV (0.2 mm/s)
Commercial and community facilities (including schools and places of worship)	When in use	112dBV (0.4 mm/s)
Industrial	When in use	118dBV (0.8 mm/s)
Sensitive equipment within medical or research facilities	When in use	82dBV (0.013 mm/s)

Table 8. Mechanical plant noise goals (operations)

Receiver	Time of day	Background (b/g) noise creep dBA LA_{90} (1 hour)	Acoustic quality objectives dBA LA_{eq} (1 hour)
Residential (for outdoors)	07:00 - 22:00	b/g + 0	-
	22:00 - 07:00	b/g + 0	50
Residential (for outdoors)	07:00 - 22:00	-	35
	22:00 - 07:00	-	30
Library and educational institution (for indoors)	When in use	-	35
Commercial and retail activity (for indoors)	When in use	-	45

4. Settlement

(a) Detailed design of the alignment and underground stations will be informed by a detailed ground settlement analysis, based on hydrogeological and geological modelling

(b) The settlement analysis will indicate the predicted horizontal and vertical extent of ground settlement for the Project Works and the time period over which such ground settlement would occur.

5. Hydrology

(a) A hydrogeological model will be developed during detailed design and before construction of relevant sections to determine ground conditions along the tunnel section.

(b) Further borehole investigations, groundwater monitoring and permeability testing at the station locations and along the tunnel alignment to identify and characterise any major transmissive features and better constrain the local hydrogeological model for detailed design.

(c) Review available bore construction records and target aquifers to determine the suitability of monitoring bores installed during the geotechnical investigations for ongoing groundwater monitoring for construction and commissioning. Following this review, additional bores may be proposed to address gaps identified in the groundwater monitoring network.

(d) Identify through surveys and consultation, water bores in the area potentially affected by groundwater drawdown and implement measures to mitigate potential effects on identified bores.

(e) In the event a new 'groundwater feature' (e.g. areas of high groundwater flow/ yield) is identified along the Project alignment, further detailed groundwater monitoring would be undertaken to characterise the feature and identify potential impacts to the environment. Additional management measures would be developed, where required.

(f) Develop and implement design measures and construction methods to minimise groundwater inflows in to the construction area.

(g) The Project design provides for the capture of groundwater seepage, should it enter the underground structures, and the subsequent treatment of such groundwater prior to its release to an approved discharge point.

(h) Where the project design anticipates groundwater entering underground structures, the design provides:

  (i) measures to minimise settlement due to project-induced drawdown;

  (ii) measures to ensure structural integrity and Project operational safety; and

  (iii) measures to minimise the risk of exposing acid sulphate soils to air or the chance for oxidation.

(i) The Project design achieves the water quality objectives stated for the Brisbane River Estuary environmental values and water quality objectives (Basin No. 143 mid-estuary) referred to in the Environmental Protection (Water) Policy 2009 for any water, including groundwater, released from Project infrastructure to surface waters.

(j) The Project design is based on current flooding information to achieve flood immunity to the tunnel infrastructure and underground stations in a 1 in 10,000 year annual exceedance probability (AEP) regional flood event, and a 1 in 100 AEP overland flow event.

(k) The Project design will not cause property damage from flood impacts to third parties for events up to and including the 1 in 100 AEP flood event.

(l) Project Works in Mayne Rail Yard must be designed on the basis of detailed flood modelling.

6. Cultural Heritage

(a) The Project design reflects and minimises the impact on the cultural and historical significance of places where surface works occur, and where reasonable and practicable, avoids or minimises the direct impact on heritage values of such places.

(b) The Project design acknowledges a locality's historical significance or cultural significance to Aboriginal people through input to:

  (i) place naming;

  (ii) interpretative signage and other landmarks; and

  (iii) the themes for public art.

(c) In developing the Project design, the Proponent would provide opportunities for architectural design sympathetic to the cultural heritage landscape and streetscape.

7. Climate change and sustainability

(a) Project ventilation systems are designed to minimise energy consumption while achieving acceptable passenger comfort and air quality outcomes in both the ambient environment and the Project stations and tunnel system.

(b) The Project is designed to be adaptable to conditions that may arise as a result of climate change, including accommodating the predicted 1.0 m sea level rise scenario in 2100 (upper range).

(c) Sustainability initiatives, particularly in relation to energy consumptions and savings throughout the Project lifecycle are incorporated in detailed design and tracked via a Sustainability Tool (e.g. ISCA's rating tool) through to Project implementation.

(d) In design and construction, devise and implement a process for optimising energy efficiency in construction planning and delivery (e.g. component sourcing and transportation, spoil and materials handling – no double handling, programing to avoid re-work or redundant work).

(e) In operations, energy efficient design that meets the performance criteria of all Project plant and equipment would be included in the design specification.

8. Land use and tenure

(a) Minimise the 'footprint' of the Project during both construction and operations to reduce impacts on existing land uses through design refinement.

(b) The Project design seeks to optimise land use and transport integration with:

  (i) PA Hospital, Boggo Road Busway Station, Park Road Railway Station and Boggo Road Urban Village;

  (ii) Woolloongabba Priority Development Area (PDA);

  (iii) Albert Street;

  (iv) Roma Street; and

  (v) Bowen Hills PDA.

(c) The Project is to be designed in consultation with:

  (i) Rail Infrastructure Manager in relation to use of Railway land required for project worksites; and

  (ii) Proponents for urban development projects at Boggo Road Urban Village, Woolloongabba PDA, Albert Street and Roma Street redevelopment and Royal National Agricultural and Industrial Association of Queensland (RNA) redevelopment.

(d) The Project design minimises the loss of public open space in Victoria Park during construction.

9. Visual amenity and lighting

(a) The Project design seeks to minimise the visual impact of the above-ground infrastructure with regards to its scale, height and bulk. Specific urban design and visual impact studies are required to inform detailed design for:

  (i) the station ventilation outlets and intake structures;

  (ii) the above-ground electricity feeder stations;

  (iii) the portals and transition structures; and

  (iv) noise barriers and other impact mitigation devices or structures.

(b) Where required, noise barriers are designed to reduce the visual impacts to surrounding properties and roadways by:

(i) incorporating urban design treatments and landscape elements such as massed plantings;

(ii) using clear or transparent materials to maintain existing expansive views beyond the rail corridor, subject to security and maintenance considerations being evaluated; and

(iii) avoiding the use of highly reflective materials and materials that support graffiti.

(c) Landscaping, urban design and public art treatments sympathetic to heritage landscape and streetscape values are incorporated into the design of Project Works at stations and thoroughfares accessing stations.

10. Social environment

(a) The design of stations and public spaces developed as part of the Project stations incorporate CPTED principles to maximise commuter safety.

11. Waste

(a) 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.

(b) 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.

(c) During detailed design, the feasibility of re-using material excavated from the Project is investigated.

Schedule 2. Nominated entities with jurisdiction for conditions

Table A1 lists the organisations/agencies responsible for each of the Coordinator-General's imposed conditions (listed in Appendix 1).

Table A1. Entities with jurisdiction for Coordinator-General imposed conditions

Part	Approval	Condition no.	Entity with jurisdiction
A	General conditions	1	Coordinator-General
A	Outline Environmental Management Plan	2	Coordinator-General
B	Design	3	Chief Executive, TMR
C	Construction Environmental Management Plan	4	Chief Executive, TMR
C	Compliance	5	Chief Executive, TMR
C	Reporting	6	Chief Executive, TMR
C	Environmental Monitor	7	Coordinator-General
C	Community Relations Monitor	8	Coordinator-General
C	Community engagement plan	9	Chief Executive, TMR
C	Hours of work	10	Chief Executive, TMR
C	Construction Noise and Vibration	11	Chief Executive, TMR
C	Property Damage	12	Chief Executive, TMR
C	Air Quality	13	Chief Executive, TMR
C	Traffic and Transport	14	Chief Executive, TMR
C	Water quality	15	Chief Executive, TMR
C	Water resources	16	Chief Executive, TMR
C	Surface water	17	Chief Executive, TMR
C	Erosion and sediment control	18	Chief Executive, TMR
C	Acid sulphate soils	19	Chief Executive, TMR
C	Landscape and open space	20	Chief Executive, TMR
C	Worksite rehabilitation	21	Chief Executive, TMR
D	Environmental design requirements	22	Chief Executive, TMR
D	Commissioning	23	Chief Executive, TMR

Schedule 3. Definitions

Directly Affected Persons means an entity being either the owner or occupant of premises for which predictive modelling or monitoring indicates the project impacts would be above the performance criteria in the imposed conditions.

Construction Environmental Management Plan means the Construction Environmental Management Plan referred to in Condition 4.

Outline EMP means the Outline EMP approved by the Coordinator-General in Condition 2.

Managed Work means Project Work for which either the predicted or monitored impacts meet the performance criteria at a Sensitive Place.

Non-Compliance Event means Project Works that do not comply with the Imposed Conditions

Predictive Modelling means the use of appropriate analytical scenario testing, whether or not by numerical measurements, undertaken prior to the commencement of Project Works.

Project Work means any works, including early works, demolition works or site preparation works, for construction of the project. Project Work does not include:

- any works associated with the demolition of buildings and structures on State owned land;
- works involving the relocation or replacement of public utilities when undertaken by a public utility authority or provider;
- the placement and management of spoil at spoil placement locations.

Sensitive Place means:

- a dwelling (including residential allotment, mobile home or caravan park, residential marina or other residential premises, motel, hotel or hostel)
- a library, childcare centre, kindergarten, school, university or other educational institution
- a medical centre, surgery or hospital
- a protected area
- a public park or garden that is open to the public (whether or not on payment of money) for use other than for sport or organised entertainment
- a work place used as an office or for business or commercial purposes, which is not part of the project activity(ies) and does not include employees accommodation or public roads.

Appendix 2. Coordinator-General's recommendations

This appendix includes the Coordinator-General's recommendations for the changed project.

Recommendation 1. Ecosciences building planning

The proponent should continue to undertake consultation with the key stakeholders to minimise constraints on the planned development of the stage 2 of the Ecosciences Precinct.

Recommendation 2. Greenspace planning

The proponent should liaise with Brisbane City Council to offset the loss of public open space/pocket parks in accordance with Element 6 Nature Conservation of the DOEMP.

Recommendation 3. Silicosis

The proponent should consider the findings from the Coal Workers' Pneumoconiosis Select Committee final report, Black Lung White Lies – Inquiry into the re-identification of Coal Workers' Pneumoconiosis in Queensland. Implement relevant recommendations regarding the potential impacts from silica to underground workers involved in tunnelling construction (silicosis) and include in:

(a) The Hazard and Risk sub-plan and/or

(b) The Air Quality sub-plan

Recommendation 4. Mined tunnelling

Mined tunnelling should be implemented in accordance with the *Work Health and Safety Act – Tunnelling Code of Practice 2011* and the Excavation Work Code of Practice 2017.

Recommendation 5. Myer Centre carpark

The proponent should undertakes an assessment taking into consideration the potential impacts on surface pedestrian, traffic and public transport networks of the proposed changes to exit arrangements for the Myer Centre carpark in consultation with Brisbane City Council and Myer Centre management.

Recommendation 6. Freight

The proponent should engage and consult with key stakeholders such as the Western Freight Users Group and the Rail Infrastructure Manager regarding the possession of the rail corridor to reduce potential impacts on rail freight movements during construction in accordance with Element 2 of the DOEMP.

Recommendation 7. Pavement impacts

In consultation with Brisbane City Council, the proponent should develop mitigation measures to address any assessed pavement damage on local roads from project spoil haulage.

Recommendation 8. Noise and Vibration

The proponent should consult with relevant advisory agencies in the development of mitigation measures for predicted and monitored noise and vibration impacts above the goals for the CEMP.

Recommendation 9. Dust impacts - Southern Portal / Boggo Road Railway Station worksites

The proponent should conduct predictive air quality modelling for early construction earthworks prior to the commencement of Project Works. Should exceedance of the goals in Table 4 of the Imposed Conditions be predicted, I recommend that consultation be undertaken with relevant entities including representatives of the PA Hospital, Leukaemia Foundation ESA Village, Ecosciences Precinct and the TRI building in the development of mitigation measures.

The proponent should establish real-time monitoring, with monitoring stations positioned at appropriate locations around the proposed worksites. Should exceedances of the goals in Table 4 be monitored or occur during construction, that are attributable to the project, the proponent should revise their adaptive management approach where necessary.

Acronyms and abbreviations

ACH Act	*Aboriginal Cultural Heritage Act 2003*
AL Act	*Acquisition of Land Act 1967*
ASS	acid sulfate soil
BCC	Brisbane City Council
BCR	benefit-cost ratio
BGGS	Brisbane Girls Grammar School
BGS	Brisbane Grammar School
BRUV	Boggo Road Urban Village
BTC	Brisbane Transit Centre
CAG	community advisory group
CBA	cost-benefit analysis
CEMP	construction environmental management plan
CGER	Coordinator-General's Evaluation Report
CHMP	cultural heritage management plan
CLPUFF	California Puff Model
CRR	Cross River Rail
DATSIP	Department of Aboriginal and Torres Strait Islander Partnerships
dB(A)	adjusted decibels
DEHP	Department of Environment and Heritage Protection
DHPW	Department of Housing and Public Works
DOEMP	Draft Outline Environmental Management Plan
DSD/OCG	Department of State Development (Office of the Coordinator-General)
ED Act	*Economic Development Act 2012*
EIS	environmental impact statement
EMP	environmental management plan
EMR	Environmental Management Register
EP Act	*Environmental Protection Act 1994*
EP Regulation	Environmental Protection Regulation 2008
EPP (Air)	Environmental Protection (Air) Policy 2008
ETCS	European train controlling system
FTE	full-time equivalent
GHG	Greenhouse gas
ICB	Inner City Bypass
km	Kilometres
m	Metres
Mm^3	Million cubic metres
NC Act	*Nature Conservation Act 1992*
NGER Act	*National Greenhouse and Energy Reporting Act 2007*

NPV	net present value
OEMP	Outline Environmental Management Plan
PA Hospital	Princess Alexandra Hospital
PDA	Priority Development Area
$PM_{2.5}$	particulate matter 2.5 micrometre or less in diameter
PM_{10}	particulate matter 10 micrometres or less in diameter
QH	Queensland Health
QH Act	*Queensland Heritage Act 1992*
QHR	Queensland Heritage Register
QUT	Queensland University of Technology
RNA	The Royal National Agricultural & Industrial Association of QLD
SARA	State Assessment Referral Agency
SDPWO Act	*State Development and Public Works Organisation Act 1971*
SEMS	Safety and Environment Management System
SEM	Single Event Maximum
SEQ	South-east Queensland
SP Act	*Sustainable Planning Act 2009*
SP Regulation	Sustainable Planning Regulation 2009
SWL	maximum sound power level
tCO_2-e	Tonnes carbon dioxide equivalents
TBM	tunnel boring machine
TEM	Transmission Electron Microscope
TI Act	*Transport Infrastructure Act 1994*
TMR	Department of Transport and Main Roads
TRI	Translational Research Institute
TSP	total suspended particulates

Glossary

change application	The request for project change, Volume 1, dated February 2017 and associated appendices
changed project	The project as evaluated in the Coordinator-General's change report dated June 2017.
coordinated project	A project declared as a 'coordinated project' under section 26 of the SDPWO Act. Formerly referred to as 'significant project'
Coordinator-General	The corporation sole constituted under section 8A of the SDPWO Act and preserved continued and constituted under section 8 of the SDPWOA Act
Directly Affected Persons	An entity being either the owner or occupant of premises for which predictive modelling or monitoring indicates the project impacts would be above the performance criteria in the imposed conditions
imposed condition	A condition imposed by the Queensland Coordinator-General under section 54B of the SDPWO Act. The Coordinator-General may nominate an entity that is to have jurisdiction for that condition
Rail Infrastructure Manager	A person who has effective management and control of rail infrastructure or proposed rail infrastructure, whether or not the person – (a) owns or will own the rail infrastructure; or (b) has or will have a statutory or contractual right to use the rail infrastructure or to control, or provide, access to it.
significant project	A project declared (prior to December 2012) as a 'significant project' under section 26 of the SDPWO Act. Projects declared after 21 December 2012 are referred to as 'coordinated projects'
the project	The project described in the Coordinator-General's Evaluation Report dated 20 December 2012.

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