

# Environmental Impact Statement

Request for Project Change 4

Volume 1

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## Executive Summary

The Cross River Rail (CRR) Project provides a significant increase to north-south rail capacity in Brisbane, increasing the speed and frequency of rail services, increased operational flexibility and overall network improvements.

The CRR Project is a declared coordinated project for which an Environmental Impact Statement (EIS) is required under the *State Development and Public Works Organisation Act 1971*. The CRR EIS was evaluated by the Coordinator-General, who recommended the project proceed, subject to Imposed Conditions and recommendations. Since the evaluation of the EIS, three Requests for Project Change (RfPCs) have been evaluated by the Coordinated-General, to allow for shortening and realignment of the proposed tunnels, relocation of the long-distance coach terminal at Roma Street, and the demolition of the Brisbane Transit Centre East Tower, Hotel Jen and the use of part of Lot 60 on SP207215 and Lot 35 on SP207219 as a construction worksite. The CRR Project, as currently evaluated by the Coordinator-General, including the RfPCs, is referred to in this Request for Project Change as the "Evaluated Project".

Since the assessment of the Evaluated Project, the Cross River Rail Delivery Authority (the Delivery Authority) sought proposals from bidders to deliver the CRR Project, and has undertaken further investigations into project delivery and design to maximise the benefits of the CRR Project. The bidding process and the Delivery Authority's further investigations have led to a number of Proposed Changes to the Evaluated Project.

Following the announcement of preferred bidders, the Delivery Authority, as the proponent, now applies to the Coordinator-General to evaluate the environmental effects of the Proposed Changes, the effects of the changes on the CRR Project, and other related matters.

### **Summary of the requested changes**

This Request for Project Change covers the following changes to the Evaluated Project:

- Changes to the vertical and horizontal alignments of the tunnels, to accommodate the relocation of the stations and remove curves, resulting in slightly straighter tunnels;
- Realignment of rail lines through Mayne Area, mainline enhancements which include construction of new overpass bridges for Mayne Yard East and Mayne Yard North access roads and a new rail bridge across Breakfast Creek;
- New and expanded stabling facilities at Mayne Yard;
- A new stabling facility at Clapham Yard and rail bridge over Moolabin Creek;
- Upgrades to existing surface railway stations at Salisbury, Rocklea, Moorooka, Yeerongpilly, Yeronga and Fairfield;
- Changes to Exhibition Station design;
- Changes to construction access through Victoria Park and around the Northern Portal;
- Realignment of the underground Roma Street Station, with changes to design and construction methodology;

- Replacement of a section of the Roma Street section of the Inner Northern Busway, and integration of this section of the Inner Northern Busway with the underground Roma Street Station;
- Relocation of the proposed underground Albert Street Station and Woolloongabba Station, with changes to design and construction methodology;
- Minor horizontal and vertical realignment of the Boggo Road Station, with changes to design and construction methodology and the replacement of the pedestrian underpass to the Princess Alexandra Hospital with a pedestrian overpass across the rail corridor; and
- Associated changes to construction worksites, including configuration, access, haulage, workforce parking and local traffic management.

Some of these changes result in the inclusion of works that were assessed in the 2011 EIS.

In addition to requesting that the Coordinator-General evaluate the above project changes, this RfPC also requests amendments to the Coordinator-General's Imposed Conditions as follows:

- an amendment to Imposed Condition 1 to apply the existing Imposed Conditions to the Proposed Changes;
- an amendment to Imposed Condition 6 to provide a two-week extension to the monthly reporting periods, to allow for quality assurance processes to be followed;
- an amendment to Imposed Condition 10 to provide for construction hours for the new worksites, including for Clapham Yard and the Fairfield to Salisbury Station upgrades; and
- a change to the Environmental Design Requirement 3 (noise and vibration), to align with Queensland Rail standards and specify that the criteria applies to underground stations and rail.

### ***Reasons for the changes***

The Proposed Changes to the Evaluated Project are the result of a request for tenders and evaluation process that was conducted by the Delivery Authority seeking innovative design and delivery for the CRR Project. In addition to the market process, the Delivery Authority has undertaken additional investigations, and worked with key stakeholders to maximise the benefits of the CRR Project.

The reasons for the Proposed Changes to the design of the Evaluated Project are to:

- realign the underground stations to allow opportunities for co-location with stations for the Brisbane Metro Project;
- realign the underground station at Woolloongabba to provide an increased plaza area to better accommodate event crowds;
- incorporate a replacement and upgrade of the Roma Street section of the Inner Northern Busway, to allow the station to be integrated into the underground Roma Street station;
- upgrade surface stations between Fairfield and Salisbury, to support enhanced rail services across the network;



- realign the underground stations and tunnels, to remove curves and provide for shorter, straighter tunnels, resulting in faster rail services and reduced maintenance costs;
- provide for broader network improvements through enhanced flexibility in operations, with the provision of larger stabling facilities at Mayne Yard, a new stabling facility at Clapham and new bridges at Breakfast Creek and Moolabin Creek.
- The reasons for the Proposed Changes to the delivery of the Evaluated Project are to:
- accommodate the design changes; and
- reduce the areas of cut and cover for the CRR stations and caverns, reducing noise and air quality impacts during construction.

The reasons for the Proposed Changes to the Imposed Conditions for the Evaluated Project are to:

- apply the Imposed Conditions to the Changed Project;
- allow an extended reporting period to allow quality assurance checks to be completed; and
- ensure that operational ground-borne noise criteria apply to underground stations and rail only and align operational noise and vibration criteria with updated standards.

### ***Effects of the requested changes***

The effects of the Proposed Changes are largely similar to the Evaluated Project, with some changed or new areas impacted by the Proposed Changes.

Areas that were not impacted by the Evaluated Project, that will be impacted by the Proposed Changes, include Breakfast Creek, Clapham Yard and the Fairfield to Salisbury stations. Some areas will experience changed effects, because of the realignment of certain elements of the CRR Project. Those areas include Mayne Yard, Roma Street, Albert Street and Dutton Park.

### ***Traffic and transport***

The key changed effects to traffic and transport impacts as a result of the proposed design changes are that the Changed Project:

- will provide enhanced network reliability and accessibility, made possible by changes to stabling, surface rail connections and surface station modifications;
- will provide better workforce accessibility and improved parking capacity for the Mayne Rail Yards;
- will deliver improved accessibility for pedestrians to the Princess Alexandra Hospital, and improved access to Dutton Park station as a result of the Dutton Park Station upgrade; and
- operational improvements to vehicle access, carpark layouts, and more equitable access to rail services as a result of station upgrades between Fairfield and Salisbury.

The key changed effects to traffic and transport impacts as a result of the proposed delivery changes are:

- the Changed Project will reduce impact to pedestrians and station users during construction as a result of the increase in mined tunnels and stations, rather than cut-and-cover methods;
- there will be changes to the temporary interruptions to the operation of the road network and public transport services;
- there will be changed access arrangements for some properties, including residences at Parkland Boulevard. Access will be maintained to residences at Parkland Boulevard, with traffic management measures required for construction, and a new permanent access being constructed; and
- there will be changed and increased construction haulage requirements for the road network adjoining worksites, as a result of the increased and changed spoil volumes to be removed from the CRR Project.

### ***Land tenure***

The key changed effects to land impacts as a result of the proposed design changes are:

- there will be increased surface acquisitions required, predominantly to accommodate the northern entry to Albert Street Station, Victoria Park construction access and the upgrade to Dutton Park Station; and
- there will be reduced and changed volumetric acquisitions required due to the straightened tunnel alignment.

### ***Soils, geology and geomorphology***

The key changed effects to land impacts as a result of the proposed delivery changes are:

- there will be a minor increase in the disturbance of potential acid sulfate soils around Breakfast Creek, which will be managed in accordance with the approved Outline Environmental Management Plan;
- there will be an increase in the number of properties on the Environmental Management Register directly impacted and adjacent to the works in Mayne Yard, increasing the volume of contaminated soil requiring treatment or disposal; and
- while settlement predictions largely remain the same compared to the Evaluated Project, there will be a reduced risk of settlement to the State law courts complex. There may be minor settlement impacts, not previously identified for the Evaluated Project, along the tunnel alignment between Woolloongabba Station and the Brisbane River.

### ***Landscape and visual amenity***

The key changed effects to landscape and visual impacts as a result of the proposed design changes are:

- removal of street entrances along Albert Street. By removing street structures from the roadway and adjacent footpaths, the Project complements BCC's Albert Street Vision, with the plaza entrances providing a public space to incorporate design elements of the project;



- new pedestrian bridges at Woolloongabba Station and Boggo Road Station, to increase connectivity to surrounding land uses; and
- new rail bridges across Breakfast Creek and Moolabin Creek.

The key changed effects to landscape and visual impacts as a result of the proposed delivery changes are:

- increased temporary visual impacts at Roma Street Station as a result of the extended cut and cover works for the relocation and undergrounding of the Roma Street section of the Inner Northern Busway. These impacts will be mitigated on completion of the works.

### ***Nature conservation***

The effects of the design changes for the Changed Project to nature conservation impacts remain consistent with the Evaluated Project.

The key changed effects to nature conservation impacts as a result of the proposed delivery changes are:

- new impacts at Breakfast Creek, including the removal of marine plants to accommodate the construction works for the new bridge;
- the removal of a limited number of trees in Victoria Park with medium and low retention value in order to accommodate changed construction access; and
- the need for additional controls for works at Yeronga, Yeerongpilly, Moorooka, Rocklea and Salisbury which are within a declared Fire Ant Biosecurity Area.

### ***Surface water***

The effects of the design and construction changes for the Changed Project for surface water are primarily related to the new bridge structures at Breakfast Creek and Moolabin Creek. Potential flooding and water quality impacts will be managed in accordance with the existing Imposed Conditions.

### ***Air quality***

Due to changes to the scale, method or location of construction works, updated quantitative air quality assessment (dispersion modelling) was undertaken for Mayne Yard, Roma Street Station, Woolloongabba Station, Southern Portal and Boggo Road Station. Air quality impacts would be generally consistent with the Evaluated Project.

For the Southern Portal and Boggo Road Station worksite, modelling shows a predicted exceedance of the construction air quality goals for dust nuisance at one nearby receptor. The approved Outline Environmental Management Plan already provides for appropriate environmental outcomes and performance criteria, including for dust management. Mitigation measures and a suitable monitoring program will be implemented to ensure the environmental outcomes are met.

### ***Noise and vibration***

No exceedances of the operational noise and vibration criteria in the Coordinator-General's Imposed Conditions, including the Environmental Design Requirements, are predicted.

The key changed effects to noise and vibration impacts as a result of the proposed delivery changes are:

- short term increase in predicted levels above the noise goals for construction in the Imposed Conditions at Mayne Area and will require the application of additional mitigation measures;
- a change to the locations of noise and vibration impacts from tunnel construction as a result of the changed alignment; and
- an increase in noise impacts and a change to the location of impacts at the Roma Street and Albert Street worksites, associated with the cut-and-cover works for the Roma Street section of the Inner Northern Busway, the changed worksite locations and changed access arrangements.

### ***Cultural heritage***

The key changed effects to cultural heritage are that overall, the Changed Project impacts on fewer heritage places, including places predicted to be at slight risk of building damage from construction works and settlement.

The realignment of the underground station at Roma Street to underneath the State heritage-listed Roma Street Station will require the application of additional mitigation and monitoring measures which will be developed through detailed design.

The works at the stations between Fairfield and Salisbury impact on Queensland Rail heritage values and will be managed in consultation with Queensland Rail.

### ***Social***

Generally, the social impacts and benefits across the Project are consistent with the Evaluated Project, with some changes in location.

The key changed effects to social impacts as a result of the proposed design changes are that the Changed Project:

- has reduced land, ground-borne noise and vibration impacts to the State law courts and City Hall as a result of changes in the tunnel alignments;
- allows for improved and more equitable access to the rail network for users, particularly as a result of upgrades to surface stations between Fairfield and Salisbury; and
- there will be opportunities for co-location with the proposed Brisbane Metro Station, and the integration of the Roma Street section of the Inner Northern Busway at the underground Roma Street station, providing increased opportunities for mode shift and increased usage of public transport.

The key changed effects to social impacts as a result of the proposed delivery changes are primarily that there will be new receptors impacted by construction works, particularly south of Dutton Park, and as a result of changes to worksite locations and access arrangements.



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# 1. Introduction

The Cross River Rail Delivery Authority (the Delivery Authority) established by the *Cross River Rail Delivery Authority Act 2017* (Qld) is the proponent for the Cross River Rail (CRR) Project. The Project is a declared coordinated project for which an Environmental Impact Statement (EIS) was required under the *State Development and Public Works Organisation Act 1971* (SDPWO Act). The EIS for the CRR Project (2011 EIS) was evaluated by the Coordinator-General, who recommended the project could proceed, subject to the Imposed Conditions in the evaluation report dated 20 December 2012. Since the 2012 evaluation report, three Requests for Project Change (RfPC) have been submitted and the changes evaluated. These are:

- RfPC-1 made on 5 December 2016 and evaluated on 9 June 2017 resulting in a modified project of a smaller scale with reduced potential impacts and enhanced affordability;
- RfPC-2 made on 28 June 2018 and evaluated on 31 August 2018 which addressed the temporary solution for the relocation of the Roma Street Coach Terminal; and
- RfPC-3 made on 19 November 2018 and evaluated on 14 March 2019 for the extended demolition works of the Brisbane Transit Centre.

The Evaluated Project is the authorised CRR Project as described in Condition 1 of the Coordinator-General's Project Wide Imposed Conditions, being RfPC-1, RfPC-2 and RfPC-3. The Evaluated Project is a 10.2km rail line between Dutton Park and Bowen Hills, including 5.9km of twin tunnels under the Brisbane River and Brisbane central business district (CBD) and four new high-capacity underground stations at Boggo Road, Woolloongabba, Albert Street, and Roma Street. The CRR Project also includes a new surface station at the RNA Showgrounds and an upgrade to the existing Dutton Park Station. Key design and delivery elements of the Evaluated Project are outlined in Section 2.

Since the 2017 Change Report, the Delivery Authority has sought proposals from the private sector for delivery, and operation (in part) of the Project, and has selected two preferred tenderers to undertake the Project. As a result of innovations and enhancements through the request for proposals process, a number of design and delivery changes have been identified for the Project, including some minor changes to the Imposed Conditions. These changes subject to this request for project change are referred to as the Proposed Changes throughout this report.

The CRR Project has been divided into four areas. This report describes the Proposed Changes to the CRR Project in each area within Section 3 and the changed environmental effects in each area within Section 6. These areas are shown in Figure 1.1 and Figure 1.2 below and defined as:

- Mayne Area – the rail corridor bounded by the southern side of Albion Station, the northern side of O'Connell Terrace and the southern side of Bowen Hills Station;
- Northern Area – the Exhibition loop rail corridor bounded by the northern side of O'Connell Terrace and the northern end of College Road;
- Central Area – the area between the Northern Area and Southern Area to accommodate the tunnels, including all areas required for the surface connections and the underground stations; and

- Southern Area – commences from the Southern Portal and generally follows the rail corridor to just south of the existing Salisbury railway station.



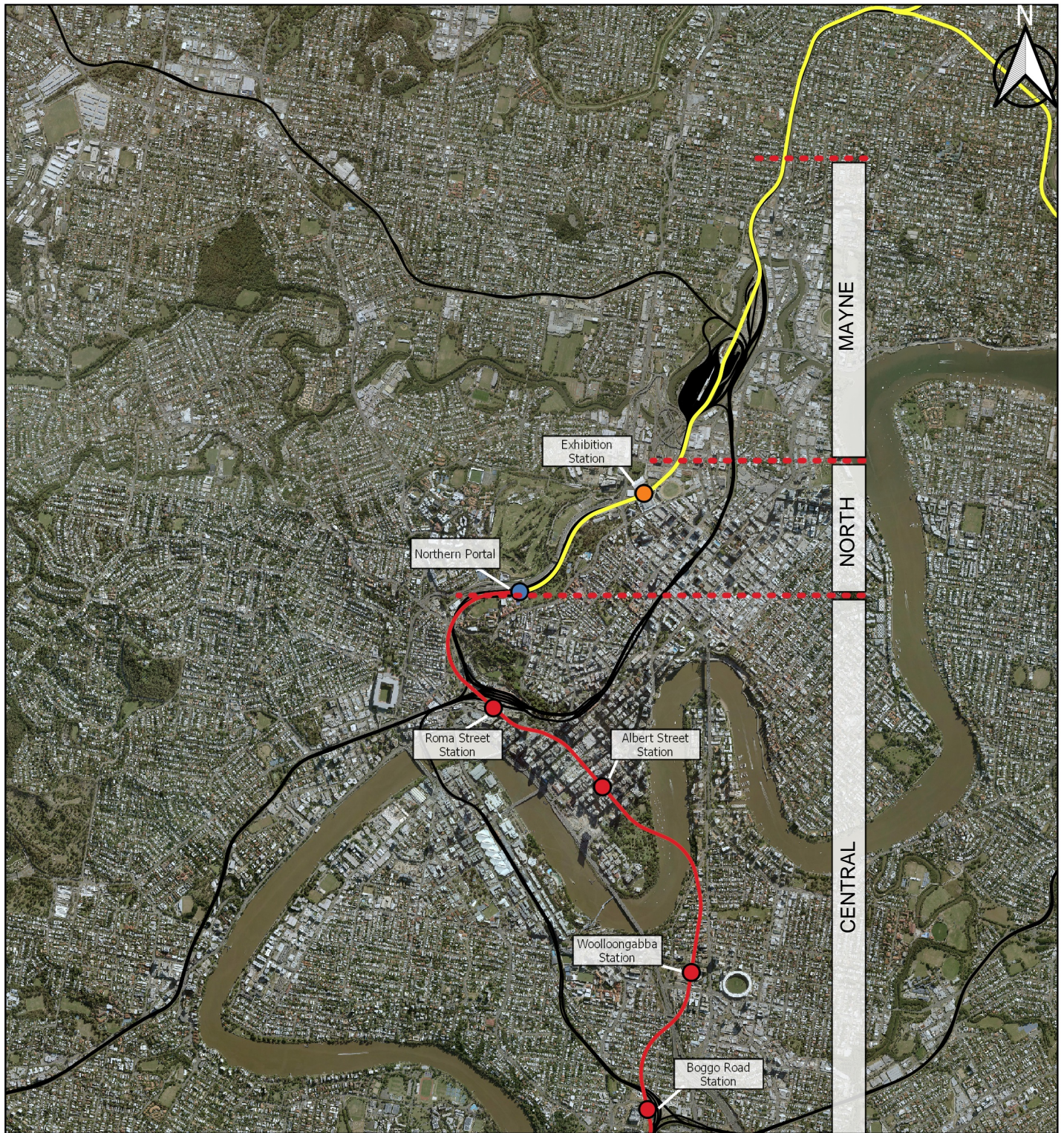


Figure 1.1: Project Geographical Areas - North

### Legend

- |  |  |   |
|--|--|---|
| <span style="color: yellow;">—</span> Above Ground Alignment | <span style="color: orange;">●</span> Above Ground Station | <span style="color: blue;">●</span> Tunnel Portal             |
| <span style="color: red;">—</span> Tunnel Alignment          | <span style="color: red;">●</span> Underground Station     | <span style="color: black;">—</span> Existing Railway Network |



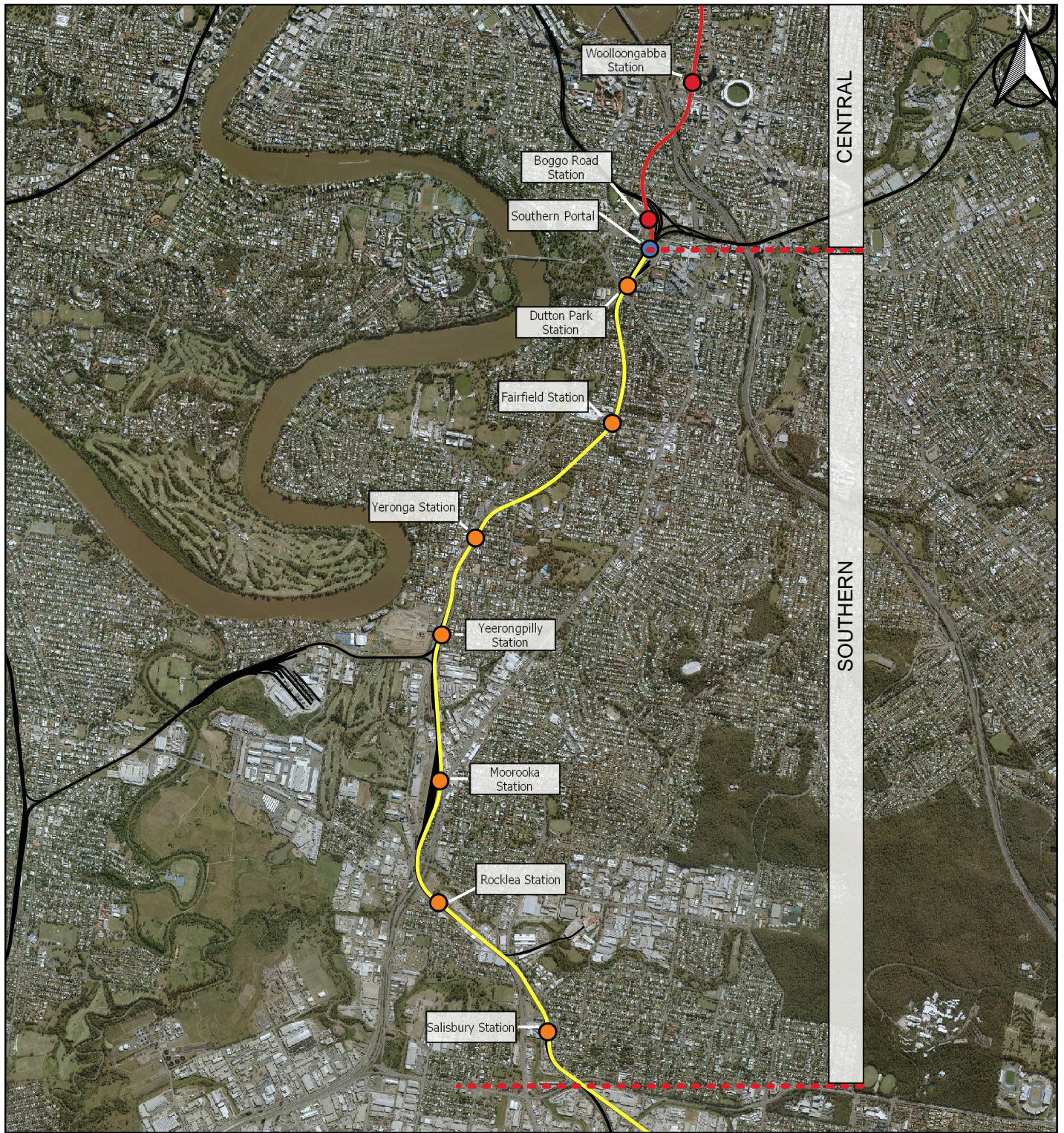


Figure 1.2: Project Geographical Areas - South

### Legend

- |  |  |   |
|--|--|---|
| <span style="color: yellow;">—</span> Above Ground Alignment | <span style="color: orange;">●</span> Above Ground Station | <span style="color: blue;">●</span> Tunnel Portal             |
| <span style="color: red;">---</span> Tunnel Alignment        | <span style="color: red;">●</span> Underground Station     | <span style="color: black;">—</span> Existing Railway Network |



The key Proposed Changes within each area include:

- Mayne Area
  - Reconfiguration of CRR track alignment;
  - Mainline enhancements which include construction of new overpass bridges for Mayne Yard East and Mayne Yard North access roads;
  - A new bridge over Breakfast Creek;
  - Alternations to the existing Mayne Yard East stabling; and
  - New stabling facilities in Mayne Yard North.
- Northern Area
  - Upgrade to the existing Exhibition Station;
  - Changed construction access in Victoria Park to Northern Portal; and
  - Repurposing of trackwork in the Normanby Yard resulting in the Up Exhibition line being 40m south around the Northern Portal area.
- Central Area
  - Changes in the horizontal and vertical alignment of both tunnels to provide a straighter and faster route;
  - The underground Roma Street Station has been realigned to the east under the rail yards and will be constructed using mined cavern method. The Roma Street section of the Inner Northern Busway will be integrated into the underground station;
  - The underground Albert Street Station will be a fully mined cavern construction minimising the surface works required. The station entrances have been consolidated into two plaza entrances, with an additional property resumption at 142 Albert Street for the northern entrance;
  - The underground Woolloongabba Station has been realigned 70m to the west which provides for better future precinct development and event day management as well as allowing the alignment of the tunnels to be straightened. The station entrances have been consolidated into a single plaza entrance; and
  - Minor changes to Boggo Road Station location and construction method with a mined northern station cavern and additional property required for temporary use during construction and to accommodate a modified final design layout. Design changes include replacing the underpass to Princess Alexandra (PA) Hospital with a new pedestrian and cycle overpass structure.
- Southern Area
  - Upgrades to existing surface railway stations at Salisbury, Rocklea, Moorooka, Yeerongpilly, Yeronga and Fairfield;
  - A new stabling facility at Clapham Yard suitable for both 6 and 9-car CRR train sets as well as cleaning, maintenance and inspection facilities;
  - New Moolabin Creek rail bridge;
  - Upgrades to new Moolabin traction power feeder station; and

- Modifications to existing rail track and infrastructure to support the operation requirements of the CRR Project.

The Proposed Changes are further described within Section 3 of this report and the key changes in each area are illustrated in Figure 3.2.

The reasons for the Proposed Changes are detailed in Section 5.

The CRR Project will be delivered in accordance with the Imposed Conditions including the Outline Environmental Management Plan (OEMP). The OEMP has been approved by the Coordinator-General and provides the overarching framework for the Project's environmental management requirements. Further information on the environmental management framework for the CRR Project is outlined in Section 4.

## 1.1 Purpose

The purpose of this Request for Project Change is to request the Coordinator-General to assess the Proposed Changes to the Evaluated Project design and delivery and to the Imposed Conditions, in accordance with Part 4, Division 3A of the *State Development and Public Works Organisation Act 1971* (SDPWO Act).

This report:

- Describes the Proposed Change and its effects on the Project;
- States reasons for the Proposed Change;
- Includes relevant information about the Proposed Changes and the changed environmental effects, to allow the Coordinator-General to make the evaluation, including:
  - the assessment of the environmental effects of the changes to the Project;
  - proposed mitigation measures in response to the environmental effects of the changes; and
- Updates Evaluated Project documentation, including Volume 2 Design Drawings, to reflect the Proposed Changes to the Project.

## 1.2 Process for Evaluation of Project Changes

The process by which the Proposed Changes to the CRR Project are to be addressed are established in Part 4, Division 3A of the SDPWO Act. The Proposed Changes trigger the requirement for the Proponent to request that the Coordinator-General evaluate the proposed:

- Changes to the CRR Project; and
- Changes to the Imposed Conditions of the Project.

In evaluating the Proposed Changes to the Project, the Coordinator-General must consider:

- The nature of the proposed change and its effect on the Project;
- The environmental impacts of the proposed change, if any;
- Any properly made submissions on the application for Project Change; and
- Any other material deemed relevant by the Coordinator-General.

The Coordinator-General must prepare a change report that makes the evaluation and may state new or changed conditions or recommendations. The Coordinator-General Change Report is given to the proponent and must be publicly notified.

## 1.3 Consultation Requirements

The Coordinator-General will determine whether or not the Delivery Authority will be required to publicly notify the Proposed Changes and its effects on the Evaluated Project. If required, public notices inviting submissions on the request will be published in local, regional and state newspapers. The consultation period is determined by the Coordinator-General and stated on the public notification.

If the request is publicly notified, any person, company or organisation may make a submission on the request. A 'properly made' submission:

- is made in writing to the Coordinator-General;
- is received on or before the deadline for submissions;
- states the name and address of each submitter;
- is signed by each submitter; and
- states the grounds of the submissions and the facts and circumstances relied on in support of the grounds.

The Coordinator-General will consider all properly made submissions and may also consider submissions that are not properly made. As part of the EIS and Evaluated Project, comprehensive consultation processes were conducted across the study corridor in respect of the CRR Project. These processes included a range of consultation activities designed to extend information about the Project and its likely effects on both delivery and operation upon communities along the study corridor. The Delivery Authority has undertaken extensive consultation with government agencies and departments regarding the CRR Project and the planned community consultation will be undertaken as part of the public notification process for this request for project change.

Land requirements would be dealt with separately through Queensland Government land acquisition processes. More information on project consultation activities is available at [www.crossriversrail.qld.gov.au](http://www.crossriversrail.qld.gov.au).

## 1.4 Relationship with Other Projects

### 1.4.1 Inner-city Construction Projects

The Project will be delivered over five years and, during this time, a number of other major inner-city developments are planned, approved or commencing construction. As such, cumulative impacts on the transport network are anticipated over the construction period which will require ongoing management.

Those projects that have been considered in the impact assessment, are:

- Brisbane Metro;
- Queens Wharf;
- Waterfront Precinct; and
- Northern Bikeway Project - Stage 2 and 3.

The approach to identify and manage these potential cumulative impacts are outlined in Section 3.5.3. In addition, the OEMP for the CRR Project sets a range of mitigation measures to minimise and manage the potential cumulative impacts on community amenity and the transport network.

### 1.4.2 Excluded Network Works

As part of normal rail operations, a number of works are planned to be delivered across the wider railway network during the operational life of the CRR Project. These works would generally be within the existing rail corridor and delivered by other entities such as Queensland Rail (QR), as part of ongoing operational works programs. Those proposed network upgrades or new works do not form part of the coordinated project, and include:

**Port freight rail line** – Current feasibility study being completed to improve rail freight connections to the Port of Brisbane, this will reduce freight movements and associated noise impacts from the city passenger lines.

**ETCS Signalling** - It is proposed to deliver the European Train Control System (ETCS) Level 2 to boost inner-city rail capacity by allowing trains to travel more frequently. This will be delivered separately to the Changed Project by the Delivery Authority.

## 1.5 Structure of the Request for Project Change

The request for project change for the CRR Project comprises the following:

- *Volume 1* – Request for Project Change (this report)

Volume 1 describes the Proposed Changes, the reasons for the Proposed Changes and the effects of the changes on the project.

- *Volume 2* – Cross River Rail Design Drawings

Volume 2 presents the Changed Project design drawings including general arrangement drawings, longitudinal and cross sections, property impact plans and station design drawings.

- *Volume 3* – Technical Reports

Volume 3 provides technical information supporting the Request for Project Change including transport, property land, air quality, cultural heritage, noise and vibration, nature conservation, landscape and visual amenity, hydrology and social.

## 2. Evaluated Project

This section provides an overview of the CRR Project which has already been evaluated by the Coordinator-General. The CRR Project has been evaluated through the:

- EIS – Submitted in 2011 and evaluated in the CRR Project Coordinator-General Evaluation Report dated 2012;
- RfPC-1 – The Coordinator-General Change Report dated June 2017 evaluated Project wide changes to the alignment and scope of works;
- RfPC-2 – The Coordinator-General Change Report dated August 2018 evaluated changes to allow the relocation of the Roma Street Coach Terminal and Project wide condition changes; and
- RfPC-3 – The Coordinator-General Change Report dated March 2019 evaluated changes to allow the demolition of the entire Brisbane Transit Centre, Hotel Jen and utilise part of Lot 60 on SP207215 as a worksite for the demolition works.

The Evaluated Project is the authorised CRR Project as described in Condition 1 of the Coordinator-General's project wide Imposed Conditions, being RfPC-1, RfPC-2 and RfPC-3.

### 2.1 Design

The design proposed a 10.2km rail line comprising:

- Twin tunnels 5.9km in length from Dutton Park under the Brisbane River to near the Brisbane Girls Grammar School (BGGS) and Victoria Park near the Inner-City Bypass;
- Four underground stations being, Boggo Road, Woolloongabba, Albert Street and Roma Street;
- One new surface station to replace the Exhibition Station, with slight relocation and design reconfiguration;
- Dutton Park Station upgraded to have a third platform;
- A single new track would be provided along the Exhibition Line from the northern portal into Mayne Yard. Two new tracks would pass through Mayne Yard to provide connections with the North Coast Line;
- Surface track work terminating south of Dutton Park;
- Reconfiguration of surface tracks between Mayne Yard and just north of Breakfast Creek and would cross Breakfast Creek via the existing rail bridge;
- One traction feeder station near Victoria Park and a substation at Dutton Park;
- Relocation of the Coach Terminal at Roma Street to Parkland Crescent; and
- Demolition of the Brisbane Transit Centre and the temporary use of part of lot 60 on SP207215 west of Parkland Boulevard and part of the railway yard (lot 35 on SP207219).



There are a number of Proposed Changes similar to that evaluated within the 2011 EIS but subsequently removed for the Evaluated Project. Reference is made to the 2011 EIS where relevant for context. Previous CRR Project components from the 2011 EIS, which are relevant for context of this assessment include:

- New surface stations at Yeerongpilly and upgrades to existing surface stations at Moorooka and Rocklea to provide disabled access and straightened platforms;
- New CRR surface tracks between Salisbury and Yeerongpilly; and
- Stabling facilities at Clapham Yard.

## 2.2 Delivery

The Evaluated Project has a construction period of five years and was expected to be completed in 2023. The Evaluated Project construction will proceed in shifts on a 24hr/7-day basis for underground work. Surface works would generally be on a 12hr/6-day basis with extended work hours for particular circumstances including works within the railway corridor, delivery of oversized equipment and works that require continuous activity (e.g. concrete pours) in accordance with the Imposed Conditions for the Project.

The Evaluated Project was expected to generate 1,547 construction jobs, while the operational stage would generate 576 jobs.

There are a number of early works required to be undertaken prior to commencing construction of the Evaluated Project. These works include:

- Relocation of existing services in areas likely to be affected by the Project works;
- Land acquisition for both surface and sub-surface land requirements;
- Demolition of buildings to allow the establishment of Project worksites; and
- Taking possession of sections of the surface rail network to establish worksites and facilitate Project works.

Some preliminary works, including land acquisition and demolition have commenced for certain aspects of the CRR Project and will continue up to and into commencement of construction. Other preliminary works will be undertaken in preparation of construction commencement.

### 2.2.1 Construction Methodology and Worksites

A summary of key construction methodologies proposed for the Evaluated Project is outlined in Table 2.1.

**Table 2.1. Key delivery aspects of the Evaluated Project**

Evaluated CRR Project Construction
<ul style="list-style-type: none"> <li>• A mined section between Woolloongabba Station and Boggo Road Station. Mined tunnel construction could involve the use of road header machines to construct different tunnel and cavern cross-sections and may involve drill and blast techniques.</li> <li>• Tunnel construction required two tunnel boring machines with a cutting diameter of 7.0m to accommodate the reinforced concrete segmented lining and allow a clear operational diameter of 6.0m.</li> <li>• Tunnel boring machines commence from the Woolloongabba worksite resulting in the bulk of spoil material reporting back to that site, and the bulk of tunnel construction materials being delivered to that site.</li> </ul>

#### Evaluated CRR Project Construction

- The Northern Portal would be located entirely within the Exhibition Line rail corridor adjacent to the BGGS and would be an open construction employing a combination of excavation and drill and blast methods.
- Construction works for the Northern Portal would be supported by a worksite occupying the Exhibition Line rail corridor and an area in Victoria Park. Access to this worksite would be via the rail corridor and from a two-way entry point off Bowen Bridge Road and from Gregory Terrace through the Brisbane City Council compound
- The Southern Portal is located north of Dutton Park Station and to be constructed by a combination of excavation and drill and blast methods.
- Boggo Road Station would have a cut-and-cover construction for the main station box extending to include tunnels for rail connections to the surface network and pedestrian underpass tunnel.
- Woolloongabba Station will have a cut-and-cover station box with mined cavern sections and entail an acoustic shed.
- The Albert Street Station would be constructed from a central shaft established by cut-and-cover methods within an acoustic enclosure. Mined caverns would be constructed between Margaret Street and Mary Street and between the central shaft near Mary Street and Elizabeth Street. Works would require the closure of part of Albert Street.
- Roma Street Station would be a large central cut-and-cover construction with mined caverns extending to the south-east and north-west along the alignment and would require the demolition of the Brisbane Transit Centre (RfPC-3).

The CRR Project is a large and complex construction undertaking. Necessarily, works will progress across multiple worksites to achieve technical construction requirements, program and cost efficiencies. For the Evaluated Project a number of worksite locations across the inner city are proposed:

- Mayne Yard – for surface works and track integration work;
- RNA Showgrounds and O’Connell Terrace – for station upgrades and local road works;
- Victoria Park – for the northern portal and track integration works;
- Roma Street – for the underground station;
- Albert Street – for the underground station;
- Woolloongabba – for the underground station and for major tunnelling works;
- Boggo Road on Joe Baker Street – for the underground station; and
- Dutton Park adjacent to Kent Street – for the southern portal.

Under the 2011 EIS additional worksites for Southern Area works and station upgrades were evaluated but were subsequently removed from the Evaluated Project. These included:

- Yeerongpilly – for surface works, and a large site off Station Road for track integration works and major tunnelling works);
- Clapham Yard – for stabling works;
- Moorooka – for station upgrades and track work;
- Rocklea – for station upgrades and track work; and

- Salisbury – for station upgrades, local road works and track work.

## 2.2.2 Construction Spoil and Haulage

Under the Evaluated Project, the underground works, as well as surface works, estimated a total spoil volume of approximately 0.97 million bank cubic metres. Bank cubic meters (bcm) refers to the volume of undisturbed soils, in the ground. The quantities of spoil generated at each of the worksites and total and peak truck movements required is presented in **Table 2.2**.

**Table 2.2. Spoil volumes and peak spoil haulage generated at worksites in Evaluated Project**

Worksite	Spoil Volume <sup>1</sup>	Peak Truck Movements (Loads/day)
Southern Portal	39,000	12
Boggo Road Station	119,000	46
Woolloongabba Station	470,000	142
Albert Street Station	135,000	32
Roma Street Station	112,000	39
Northern Portal	65,000	31
Mayne Yard	36,000	20
<b>Total</b>	<b>0.976 million bcm</b>	<b>322</b>
<b>Estimated Trucks (Loads)<sup>1</sup></b>	<b>77,000</b>	

<sup>1</sup> Assumed truck load of 30 tonnes equivalent to 12.5 m<sup>3</sup> in-situ material.

Five locations were nominated for spoil placement, being sites at Brisbane Airport, Swanbank, Pine Mountain, Larapinta and Port of Brisbane. Spoil and material would be transported by trucks from the work sites on pre-determined, designated haulage routes.

## 2.3 Operations

It has been a consistent aspect of the CRR Project that QR would operate the CRR Project as the railway infrastructure manager. QR would hold all necessary approvals for operational safety, management, signalling and fleet management. Scheduling of services would be managed by QR as the railway manager in consultation with TMR, under current governance arrangements.

### 3. Changes to CRR Evaluated Project

The Evaluated CRR Project is illustrated in **Figure 3.1** with the key Proposed Changes illustrated in **Figure 3.2** and described in detail in this following section.





Figure 3.1 Evaluated Project



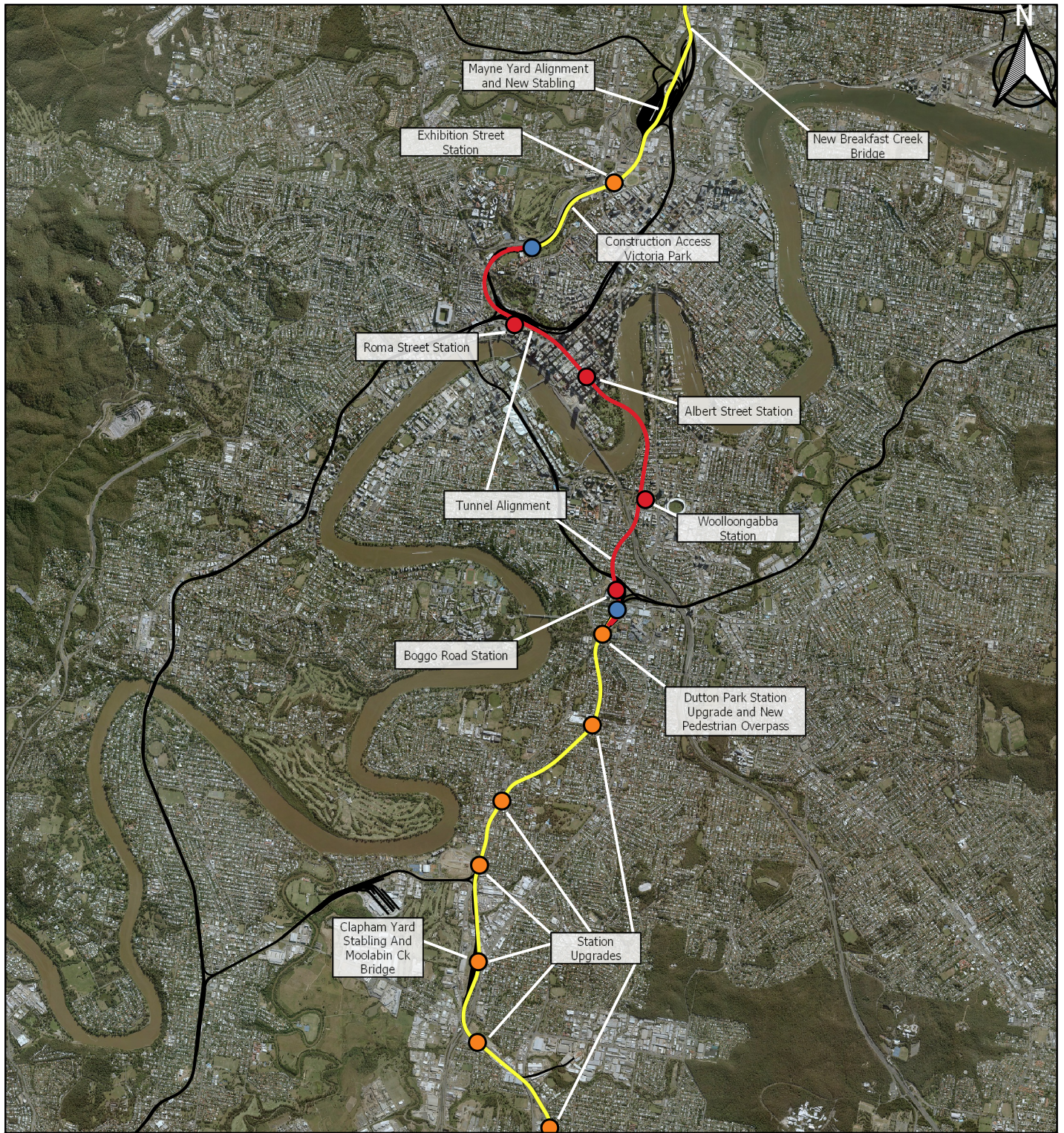


Figure 3.2: Proposed Changes to CRR Project

### Legend

- |  |   |   |
|--|---|---|
| <span style="color: yellow;">—</span> Surface Rail Alignment | <span style="color: orange;">●</span> Above Ground Stations | <span style="color: blue;">●</span> Tunnel Portal             |
| <span style="color: red;">—</span> Tunnel Alignment          | <span style="color: red;">●</span> Underground Stations     | <span style="color: black;">—</span> Existing Railway Network |



## 3.1 Mayne Area

### 3.1.1 Alignment

In the Mayne Area, the Evaluated Project includes two new CRR lines, one situated at-grade between Mayne Yard West and Mayne Yard East and one on the eastern side of Mayne Yard, with the track partly contained within a trough (underpass). For the Evaluated Project, the CRR lines cross on the existing Breakfast Creek rail bridges then connect to the existing network just south of Albion Station (within the existing rail corridor) with the North Coast Line. The evaluated alignment through Mayne Area is shown in Figure 3.3.

Mayne Yard is the integral stabling and maintenance precinct for QR daily network operations and changes are proposed to avoid impacts from the demolition and relocation of critical QR assets, maximise design speeds and minimise impacts to the existing operational QR network. Figure 3.4 shows the proposed surface rail alignment changes for the Mayne Yard Area. The Proposed Changes are within the existing rail corridor. Key elements of the enhanced geometry include:

- The Up and Down CRR lines pass under the Ferny Grove flyover on a similar alignment to the Evaluated Project with the tracks separated by more than 100m as a result of passing either side of the Mayne Yard East;
- The Up CRR alignment has a curve immediately north of the flyover to pass on the west side of Mayne Yard North rather than the east;
- A new shunt leg connecting to Mayne West and the Service Shed Area;
- Mainline enhancements which include construction of new overpass bridges for Mayne Yard East and Mayne Yard North access roads;
- The underpass (trough structure) at Mayne Yard has been removed;
- A straighter alignment between the Ferny Grove flyover and Albion overpass for the Up and Down CRR line and the Down Main line;
- The Up and Down CRR and Down Main line cross Breakfast Creek on a new rail bridge approximately 50m west of the existing crossing and tie into the existing curve south of Albion overpass, rather than south of Breakfast Creek; and
- Provision of the small retaining wall between the Main Down and Main Up Crossover connection lines immediately north of Breakfast Creek to address the vertical difference in elevation of the tracks prior to their convergence.



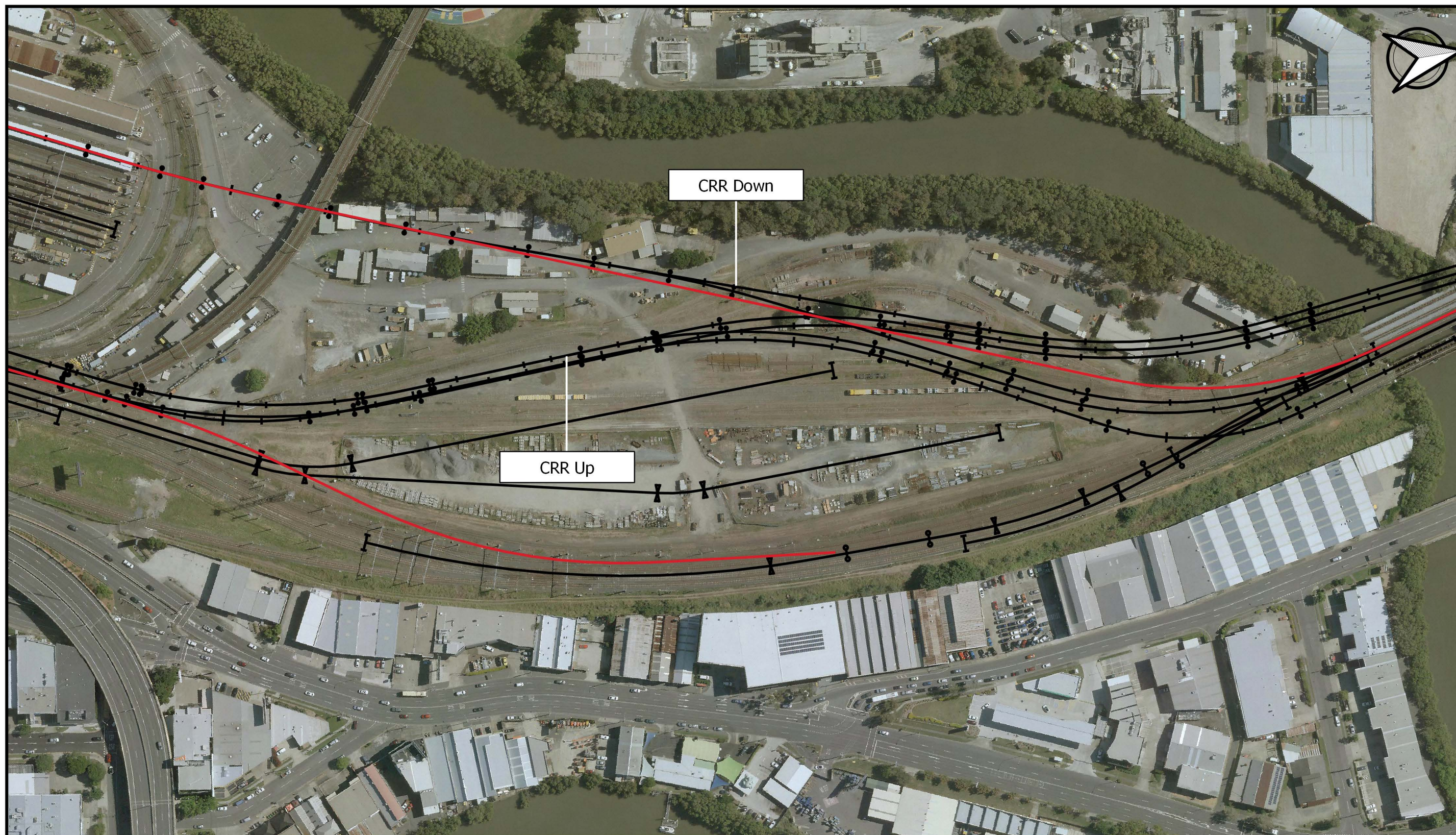


Figure 3.3: Mayne Yard Alignment Changes



### 3.1.2 Surface Work

Within the Mayne Yard Area significant engineering and planning has been undertaken to optimise the operational function, minimise the impacts to existing QR operations and achieve main line design speeds of 60 to 80km/hr. Under the Proposed Changes there will be a material increase in the surface works required in the Mayne Yard Area. These works are within in the rail corridor. The key changes include a new Mayne Yard North stabling facility, mainline enhancements which include construction of new overpass bridges for Mayne Yard East and Mayne Yard North access roads and a new bridge over Breakfast Creek, realignment of the Down CRR line and crossovers, a short retaining wall north of Breakfast Creek, and track works to facilitate the changed alignment. These are shown in Figure 3.4 and detailed in Table 3.1.

Construction works will occur within Mayne Yard North, Breakfast Creek, Mayne Yard East, the southern entrance to Mayne Yard, Bowen Hills Junction and the rail corridor to the east of Mayne Yard East. Such activities are similar in nature to the Evaluated Project, however, are increased in scale and intensity and will include:

- Demolition of existing buildings in Mayne Yard North (surveyors depot, track maintenance depot, shunters facilities, signal construction depot, electrician's depot, civil and structures depot, network protection depot and track construction depot) with relocation undertaken by QR;
- Demolition of the Mayne Yard East diesel loco facilities, and demountable building adjacent to H Block;
- Shipping containers near H Block will be relocated;
- The demolition of the existing eastern two track rail bridge (suburban line bridge);
- Alterations to the northern most pier and northern abutment of the existing bridge over Breakfast Creek to facilitate the construction of the new 3-track bridge;
- Civil works including earthworks, fencing and security, car parking, access roads and drainage;
- Removal of spoil, including contaminated materials (under soil disposal permit); and
- Crushing and screening activities.

New construction activities include the new Mayne North Stabling Yard, facility and graffiti removal shed, construction of new overpass bridges for Mayne Yard East and Mayne Yard North access roads, construction of a new bridge structure across Breakfast Creek and track works north of Breakfast Creek. Table 3.1 describes the Proposed Changes from the Evaluated Project associated within Mayne Area.

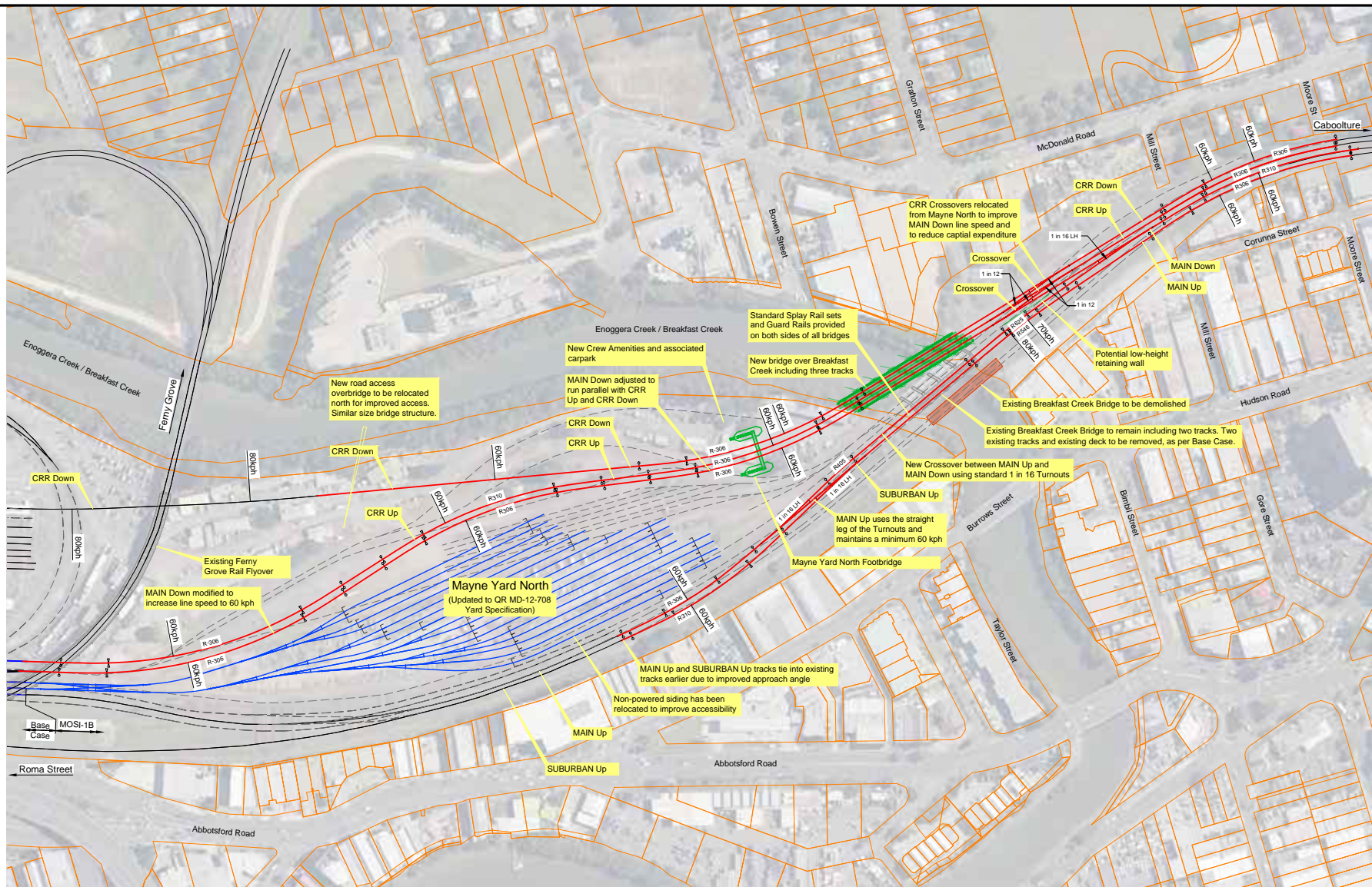


Figure 3.4: Mayne Yard Proposed Changes



**Table 3.1. Proposed Changes at Mayne Area**

Aspect	Proposed Changes
New Breakfast Creek bridge	<p>Construction of a new 3-track bridge consisting of pre- stressed concrete slabs across Breakfast Creek. The vertical height is above the 100 ARI flood event level.</p> <p>The new bridge will be constructed away from the operating Main and Suburban lines. Entry and exit to the northern and southern banks, in relation to abutments, will be from the established QR entry gate at Grafton Street and from Lanham Street respectively.</p> <p>The demolition of the existing rail bridge, being the two-track rail bridge (Suburban line bridge).</p> <p>Alterations to the northern most pier and northern abutment of the existing bridge over Breakfast Creek to facilitate the construction of the new 3-track bridge.</p>
Cross River Rail tracks	<p>At grade solution, with a straighter alignment between the Ferny Grove flyover and Albion overpass for the Up and Down CRR line and the Down Main line. The CRR and Down Main lines cross Breakfast Creek west of the existing crossing.</p> <p>Overhead Line Electrification Works required are fundamentally the same as the Evaluated Project, other than the location of the support masts which are dictated by track geometry.</p>
Mayne Yard West Shunt Leg	Shunt leg connecting to Mayne West and the Service Shed area
Main and Suburban lines	<p>Realignment of the Down Main line immediately to the North of the Ferny Grove viaduct to pass over the new bridge as opposed to the evaluated Main line bridge.</p> <p>Relocation of the proposed crossovers between the Down and Up Main line and CRR Up lines from adjacent to Mayne Yard North to north side of Breakfast Creek.</p> <p>The level difference between the new bridge and existing bridge will require a low height retaining wall between the Down and Up Main Crossover connection lines.</p> <p>Crossover connection lines north of Breakfast Creek up to the Albion Overpass.</p>
Feeder station	No change.
Mayne Yard North Stabling	<p>A new stabling facility for 14 x 6 car trains, a graffiti removal track and non-electrified track of 115m.</p> <p>Demolition of signal construction depot, rail construction depot, surveyors' depot, track maintenance depot and Mayne Yard North shunters facilities.</p> <p>Vehicular and pedestrian access from the south under the existing Ferny Grove underpass then via a new road overpass over the CRR lines and Down Main tracks.</p> <p>A new building for the provision of train crew facilities along with support services such as cleaners.</p>
Mayne Yard East Stabling	<p>Demolition of existing diesel loco facilities located in Mayne Yard East to allow the reconfiguration of Mayne Yard East entry.</p> <p>Vehicular and pedestrian access between the west and east stabling yards will be provided by an overpass over the Down CRR line.</p>

## 3.2 Northern Area

### 3.2.1 Track and Civil Works

Track works to existing surface tracks required in the northern section of the Project are generally in accordance with the Evaluated Project. The proposed Northern Portal design includes a repurposing of existing tracks within the Normanby Yard which would see the Up Exhibition line relocated from the northern side of the QR corridor to the southern side of the QR corridor approximately 25m away from the Brisbane Girls Grammar School (BGGs) Sports Centre (the closest building at BGGs) compared to the existing distance of 65m in the Evaluated Project.

The Evaluated Project required the alteration or relocation of existing rail infrastructure and road, pedestrian and public utility infrastructure within the surface rail corridor. With further design it has been identified that civil structural works required in the Northern Area include:

- Land bridge pier protection;
- Replacement train wash subway - extension of the existing subway;
- INB bridge pier protection;
- Bowen Bridge Road bridge - protection/strengthening works to the existing structure
- Bowen Bridge Road footbridge - a new footbridge which connects Exhibition Station to Bowen Bridge Road and provides connectivity to the Herston Health Precinct;
- Down line viaduct at Exhibition Station, no viaduct required for the up line with Up and Down mains by upgrading the existing pedestrian underpass;
- O'Connell Terrace Road bridge - protection works; and
- Signalisation of O'Connell Terrace construction access intersection.

Realignment of the Combined Services Route will be required between Bowen Bridge Road and O'Connell Terrace as it conflicts with construction. This is a site wide system that incorporates power, signalling and telecommunication cables that are vital to QR operations. The Combined Services Route is contained in pit and pipe and otherwise runs above ground in steel trunking.

### 3.2.2 Exhibition Station

The Evaluated Project has a new Exhibition Station located between Bowen Bridge Road and O'Connell Terrace, which consists of a dual platform connected by vertical transport and an overpass. The Changed Project involves constructing a new centre island platform, new track on a structure (at existing track level to the north of the existing tracks), with pedestrian access to platform via under-platform viaducts and stairs leading up onto the platform. Pedestrian access into the RNA showgrounds will be from Bowen Bridge Road the underpass, ramps and elevated walkways and from O'Connell Terrace via the existing RNA access paths. The site plan and cross section of the CRR Exhibition Station for the Evaluated Project is shown in Figure 3.5 and Figure 3.6, respectively.

At Exhibition Station, the Changed Project is substantially similar to the Evaluated Project, in terms of its location, scale and function. The Changed Project will retain reposition the Exhibition Station platforms into one centre platform, and would upgrade visual appearance to be consistent with the other CRR Project surface stations and improve the integrated pathways for independent access. The proposed works will include:

- Station upgrade will have an island platform configuration and extending its length to accommodate up to 9-car trains (220m).
- The horizontal track alignment retained where possible;
- An integrated pedestrian bridge between platform with pedestrian links between Bowen Bridge Road and retention of the existing underpasses. The existing O'Connell Terrace entrance will be retained via the existing RNA access paths; and
- Existing QR staff car park reconfigured but retains the existing 30 spaces.

The Proposed Changes to the Exhibition Station site plan are provided in Figure 3.7.

**NOT FOR  
CONSTRUCTION**  
7 February 2017

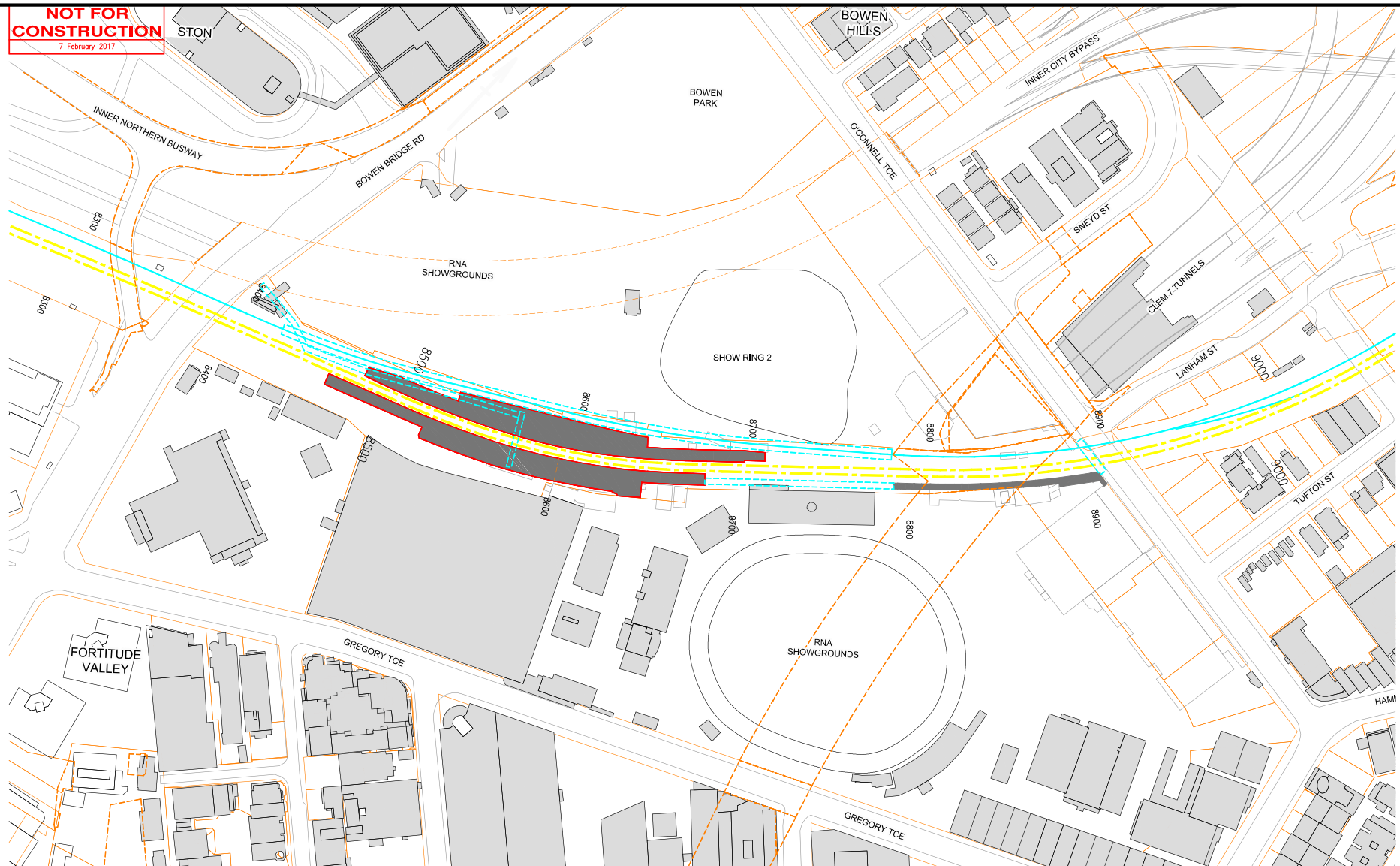


Figure 3.5: Evaluated Exhibition Station Site Plan

**Legend**

- |   |  |
|---|--|
|  Station Outline     |  Relocated Narrow Gauge Track |
|  Property Boundaries |  Proposed Bridge Structure    |
|  CRR Track           |  Existing Rail Centerlines    |

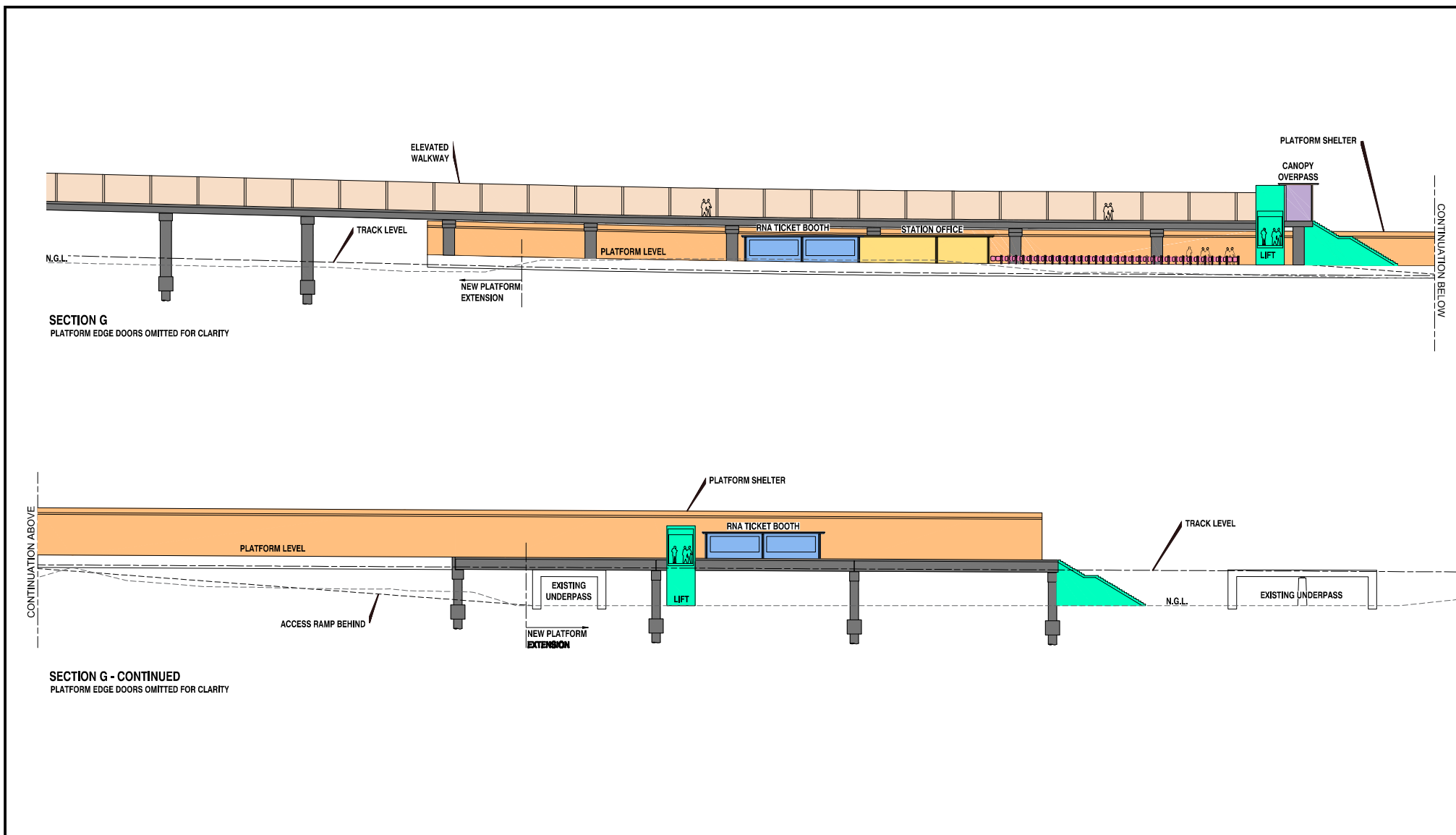


Figure 3.6: Exhibition Station Cross Section - Evaluated Project

### Legend

Paid Area  
 Unpaid Area  
 Fare Gate

Vertical Transport  
 Platform Edge Doors  
 Station Accommodation  
 Retail  
 Ramp  
 Overpass

--- Natural Ground Level  
 --- Proposed Retaining Wall





Figure 3.7: Exhibition Station Site Plan - Proposed Changes



## 3.3 Central Area

The following changes relate to the Central Area which includes the portals, tunnel and underground stations.

### 3.3.1 Tunnel

The proposed alignment changes to the tunnels provide a straighter and faster alignment. The Proposed Changes to the CRR alignment are shown in Figure 3.8.

Key minor changes are proposed to the horizontal and vertical alignment from Boggo Road Station to Woolloongabba Station to increase train speeds and reduce maintenance requirements. This alignment change results in the Woolloongabba Station moving 70m west achieving a better public space and precinct.

From Woolloongabba Station to Albert Street the track curvature is optimised resulting in the alignment under Botanic Gardens being slightly to the east. In addition, the vertical alignment has been deepened to increase rock cover under the Brisbane River. The tunnels tie into Albert Street Station which has moved 80m north west along the alignment.

From Albert Street to Roma Street, a single 1,200m radius curve replaces reverse 300m curves to diverge at City Hall and head under the QR corridor. This increases the distance of the tunnels from the Queensland law courts complex. The alignment north of Roma Street Station and the Northern Portal is consistent with the Evaluated Project.

There are minor changes to the tunnel design that are considered to be generally in accordance with the Evaluated Project and unlikely to change the Project impacts. These include:

- The internal diameter of the tunnels is increased slightly to meet QR requirements for minimum electrical clearances;
- The external diameter of the tunnels will be approximately 7m as in the Evaluated Project;
- Cross passages are proposed every 244m instead of 240m, consistent with National Fire Protection Association (NFPA) 130, Standard for Fixed Guideway Transit and Passenger Rail Systems requirements; and
- Updated tunnel design drawings are provided in Volume 2 of this Request for Project Change.





These changes reduce the overall length of all tunnel works, compared to the Evaluated Project and allows 80km/hr train speeds to be maintained through the tunnel reducing the journey time by 19 seconds in both directions.





Figure 3.8: CRR Project Tunnel Alignment Changes

#### Legend

- |   |                                     |   |                         |
|---|-------------------------------------|---|-------------------------|
|  | Proposed Change to Tunnel Alignment |  | New Underground Station |
|  | Evaluated Project Tunnel Alignment  |  | Tunnel Portal           |



### 3.3.2 Roma Street Station

Due to the changed tunnel alignment, the location of the proposed underground CRR Roma Street Station has been relocated to the east under the rail yards, as shown in Figure 3.9. The station design includes a service building at the western end, emergency egress shaft at the eastern end and a single plaza entry at the centre of the station. The Proposed Change improves future flexibility of land use for the properties along the Roma Street frontage and increases the availability of the area for future precinct developments, such as Brisbane Live. The changed general perspective is shown in Figure 3.10 and two station cross sections in Figure 3.11 and Figure 3.12.

Proposed Changes at Roma Street also integrate the proposed Roma Street section of the Inner Northern Busway (INB) with the underground Roma Street Station by lowering the INB through this area. The proposed underground busway station will be located below, and integrated with, the new station plaza, to provide pedestrian connectivity to Roma Street. The plaza would serve as a single entrance point providing connections to the INB, underground CRR rail and the existing surface rail integrating the site as a transport hub. The concept design of the plaza has a high roof canopy with open glazed sides to allow natural light and uses transparent materials to open up views to the State heritage listed Roma Street Railway Station. A photo visualisation of the Roma Street Station plaza entrance is shown in Figure 3.13. This fronts Roma Street and has two linked gate lines servicing a common paid area with access to all platforms to allow passengers to interchange between surface bus and rail and underground bus and rail.

The proposed new INB alignment consists of an eastern tie-in at the existing signalised busway intersection below the eastern corner of Emma Miller Place, a western tie-in at a reconfigured intersection at Countess Street busway overpass / underpass. The underground busway station will have lift and escalator connections directly from plaza to platform levels, provides new underground inbound and outbound platforms and provides intermodal connection between busway, underground station and existing surface rail. The proposed Roma Street section INB alignment is shown on the drawings within Volume 2. The relocation of the existing busway will allow for better outcomes for future redevelopment of the precinct by removing potential conflicts, including potential conflicts with the proposed Brisbane Live entertainment arena, provide an improved integration of transport infrastructure and renew the aging INB asset and remove physical and visual barriers.



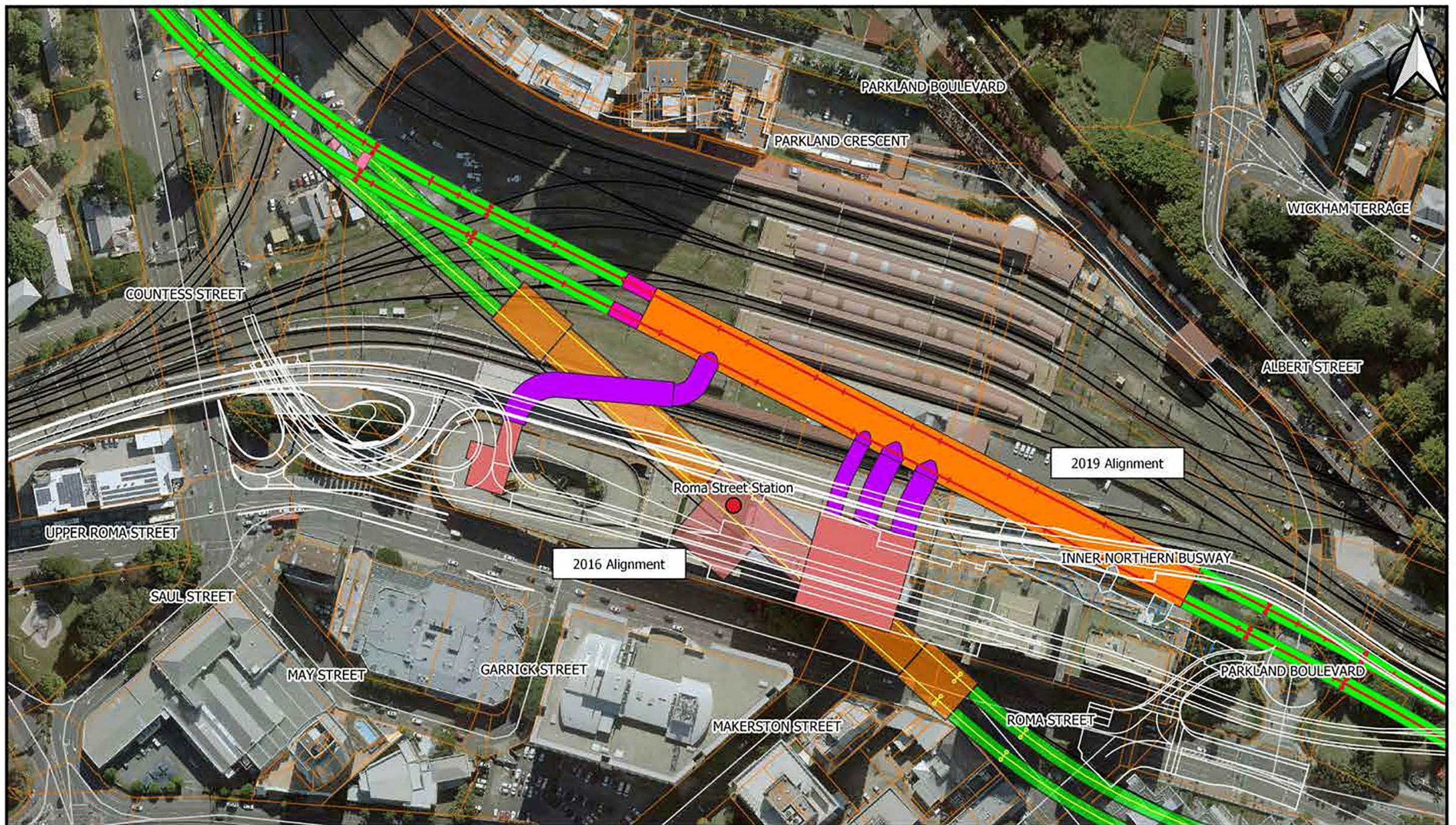


Figure 3.9: Change to Roma Street Station Location

**Legend**

<span style="color: red;">—</span> 2019 Alignment	<span style="color: black;">—</span> Existing Rail Network	<span style="border: 1px solid black; display: inline-block; width: 10px; height: 10px;"></span> Property Boundaries	<span style="background-color: purple; width: 10px; height: 10px;"></span> Mined Tunnel	<span style="border: 1px solid black; display: inline-block; width: 10px; height: 10px;"></span> Temporary Adit/Cavern
<span style="color: red;">●</span> Underground Station	<span style="color: grey;">—</span> Roadway	<span style="background-color: pink; width: 10px; height: 10px;"></span> Cross Passage	<span style="background-color: orange; width: 10px; height: 10px;"></span> Mined Cavern	<span style="color: blue;">—</span> Inner Northern Busway
	<span style="color: grey;">- -</span> Busway	<span style="border: 1px solid black; display: inline-block; width: 10px; height: 10px;"></span> Cut and Cover Structure	<span style="background-color: green; width: 10px; height: 10px;"></span> TBM Running Tunnel	



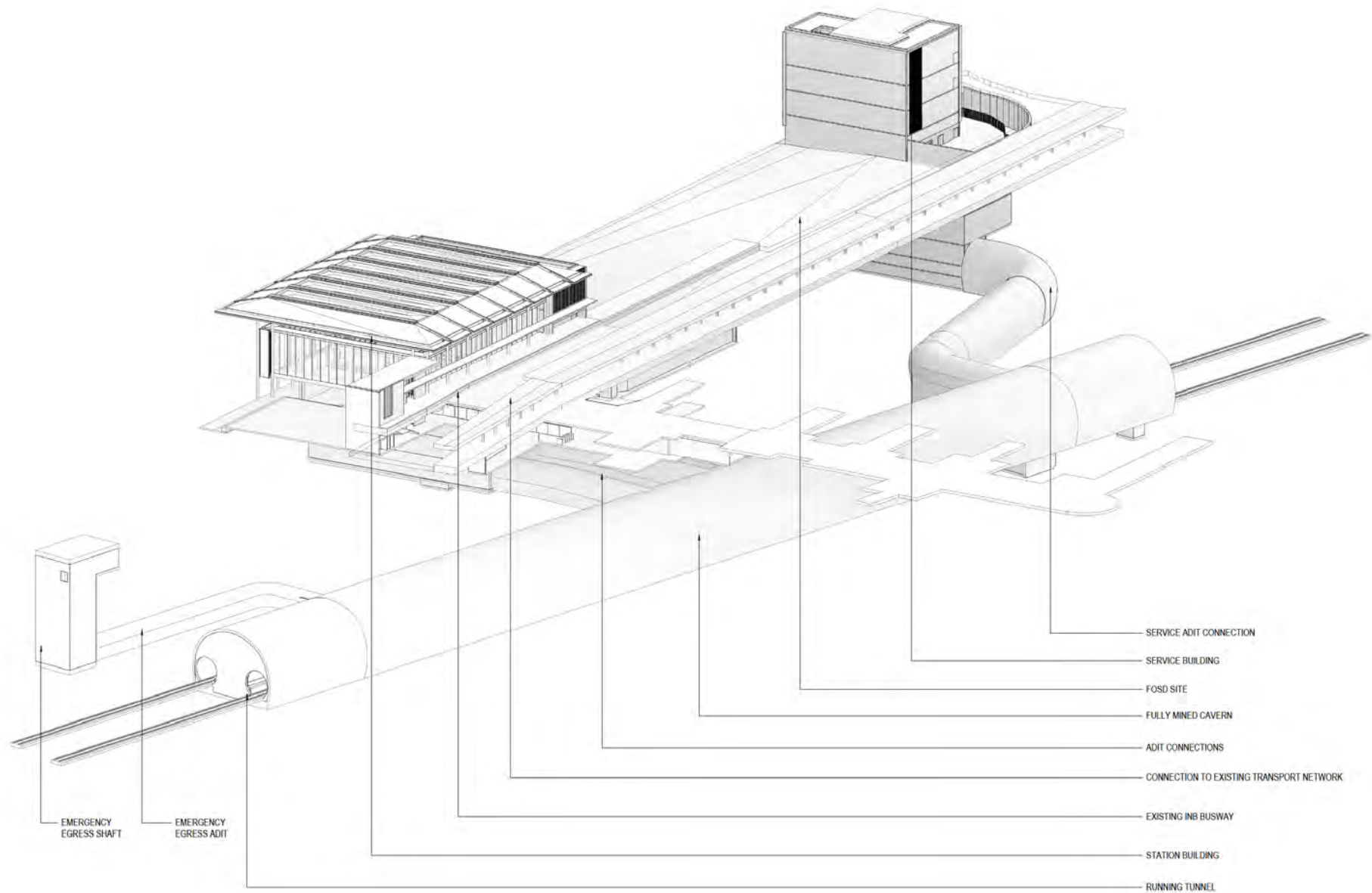


Figure 3.10: CRR Roma Street Station Perspective



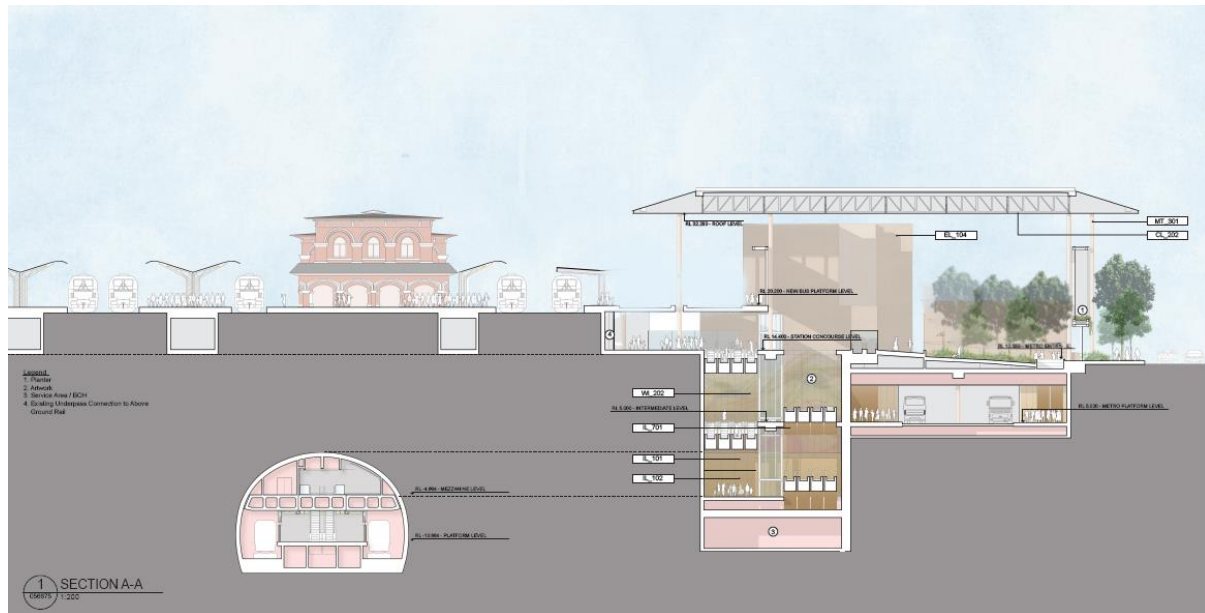


Figure 3.11 Changed CRR Roma Street Station cross section



Figure 3.12 Changed CRR Roma Street Station cross section – view from Roma Street



*Figure 3.13 Visualisation of changed CRR Roma Street Station plaza entrance*

In the Evaluated Project, station construction is a large central cut-and-cover method with extended mined caverns. Proposed Changes have the station constructed mostly as a mined cavern supported from two deep shafts constructed by cut-and-cover methods from Lot 60 and at the existing coach ramps. The construction shaft in Lot 60 will have an acoustic enclosure and will be used to contain spoil removal and tunnel operations for the construction period. This delivery methodology moves major works underground, allows 24-hour construction and allows the Brisbane Transit Centre and Hotel Jen demolition works to occur during station construction, reducing schedule risk and surface construction impacts.

The construction of the proposed new underground Roma Street section of the INB requires a cut-and-cover tunnel generally parallel with Roma Street, at the southern edge of the Brisbane Transit Centre site. This materially increases the area of cut-and-cover required within the Brisbane Transit Centre site to allow the lowering of the busway.

As there is structural dependency with Brisbane Transit Centre and the current INB, buses will be diverted to Roma Street for approximately 3 years whilst the Roma Street section of the INB is constructed. The relocation and lowering of the Roma Street section of the INB will result in impacts to public transport including diversion of buses from the busway on to Roma Street during the construction period. The duration of the diversion and the strategies to manage this impact are currently being developed as part of the detailed planning which is currently in progress through the Transport Integration Group which includes CRR, Brisbane City Council (BCC) and TransLink. This includes detailed transport modelling and mitigation measures to minimise transport impacts, including route options, infrastructure solutions and signalling.

### 3.3.3 Albert Street Station

The Evaluated Project's CRR Albert Street Station cavern was to be beneath Albert Street between Margaret Street and Elizabeth Street. The station cavern is now proposed to be shifted approximately 80m north-west along the alignment towards Roma Street to optimize the station catchment, as shown in Figure 3.14.

The cavern profile has also been increased in size to provide a mezzanine level and the multiple street entrances consolidated into two plaza entrances. The southern entrance is at the junction of Albert Street and Mary Street and the northern entrance at 142 Albert Street. Removal of street entrances along Albert Street. By removing street structures from the roadway and adjacent footpaths, the Project complements BCC's Albert Street Vision, with the plaza entrances providing a public space to

incorporate design elements of the project. This southern entrance will integrate design aspects of the Albert Street Vision project. A visual image of the southern plaza entrance is shown in Figure 3.15.

The southern station plaza footprint is 250m<sup>2</sup> and contained within one lot on the south-western corner of Albert Street and Mary Street, allowing opportunities for possible future development.

The construction methodology has also changed from a central shaft cut-and-cover with mined cavern extensions to a fully mined cavern construction. The elimination of the cut-and-cover box method reduces the spoil volume excavated, the amount of construction work required at the surface and significantly reduces interfaces with utilities.

The changed cavern and entrance locations and construction methodology removes the requirement to relocate or temporarily close the Myer Centre car park exit on Albert Street, in line with the Coordinator-General's Recommendation 5 for the CRR Project. Additional demolition works are required at 142 Albert Street to allow construction of the northern entrance.

A general perspective of the station is shown in Figure 3.16 and a cross section in Figure 3.17.





Figure 3.14: Changed CRR Albert Street Station Location

**Legend**

- |                     |                     |                         |                       |
|---------------------|---------------------|-------------------------|-----------------------|
| 2016 Alignment      | — Roadway           | Cut and Cover Structure | TBM Running Tunnel    |
| 2019 Alignment      | Property Boundaries | Mined Tunnel            | Temporary Adit/Cavern |
| Underground Station | Cross Passage       | Mined Cavern            |                       |





*Figure 3.15 Visual representation of Albert Street Station southern plaza entrance*

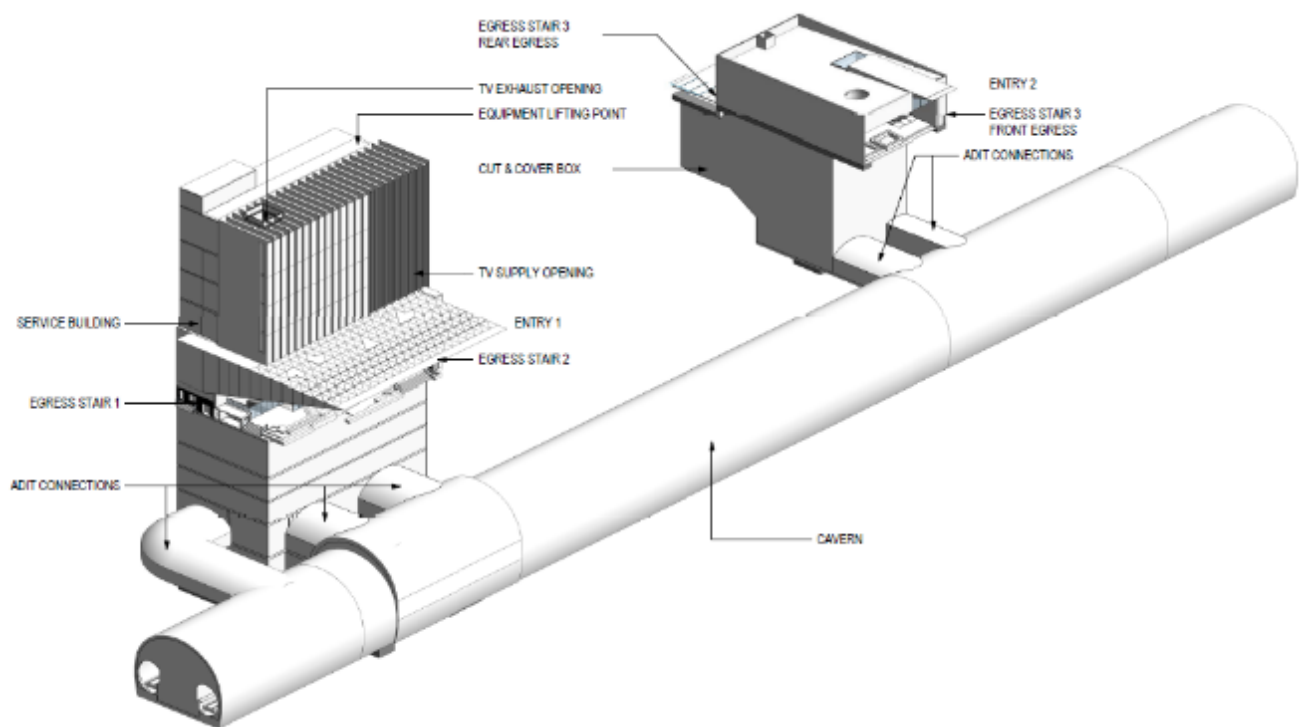


Figure 3.16 Proposed Albert Street Station general perspective



Figure 3.17 Proposed Albert Street Station cross section

### 3.3.4 Woolloongabba Station

The Proposed Changes shift the CRR Woolloongabba Station approximately 70m to the west of the Evaluated Project. The surface entrance building is located further to the south on the former Go-Print site compared to the Evaluated Project, as shown in Figure 3.18. This new location increases the distance to The Gabba to 320m providing more open space for public realm, supports pedestrian management of event crowds including integrating with a station to Gabba stadium connection, facilitates connectivity with the larger Woolloongabba precinct, improves integration with Woolloongabba bus station and allows for future integration with Brisbane Metro infrastructure. The result of the relocation accommodates the straightened tunnel alignment.

Station access is proposed within a pavilion building with a paid concourse, rather than multiple individual entry points from an open public space as proposed in the Evaluated Project. The design minimises the station footprint (400m<sup>2</sup>) and plaza footprint (7,600m<sup>2</sup>) allowing the planning objectives for the Woolloongabba PDA to be realised. The plaza connection across the existing busway has been reconfigured with a new pedestrian access bridge between Woolloongabba Station and Stanley Street over the busway. To avoid altering the existing retaining walls on the busway a new reinforced earth wall will be installed 5m behind the retaining walls.

Other design changes to improve passenger movement and experience include:

- A consolidated vertical transport shaft with a reduced number of gate lines;
- Increased cavern size to allow a new public circulation mezzanine within the cavern incorporating a large circulation hall; and
- A reduced service building scale with plant and service rooms incorporated below ground level where possible.

A visualisation of the station entrance is provided in Figure 3.19, the general perspective in Figure 3.20.

There is no material change in station construction methodology and no additional surface property requirements resulting from the changes. A temporary 11kV power supply is required at the excavation site for the tunnel boring machines and Energex will install two new 11kV feeders from WRD Wellington Road substation to the Woolloongabba Station construction site. For the permanent supply the Delivery Authority will construct a substation chamber and install lead-in conduits and pits within the site to suit installation of the substation.



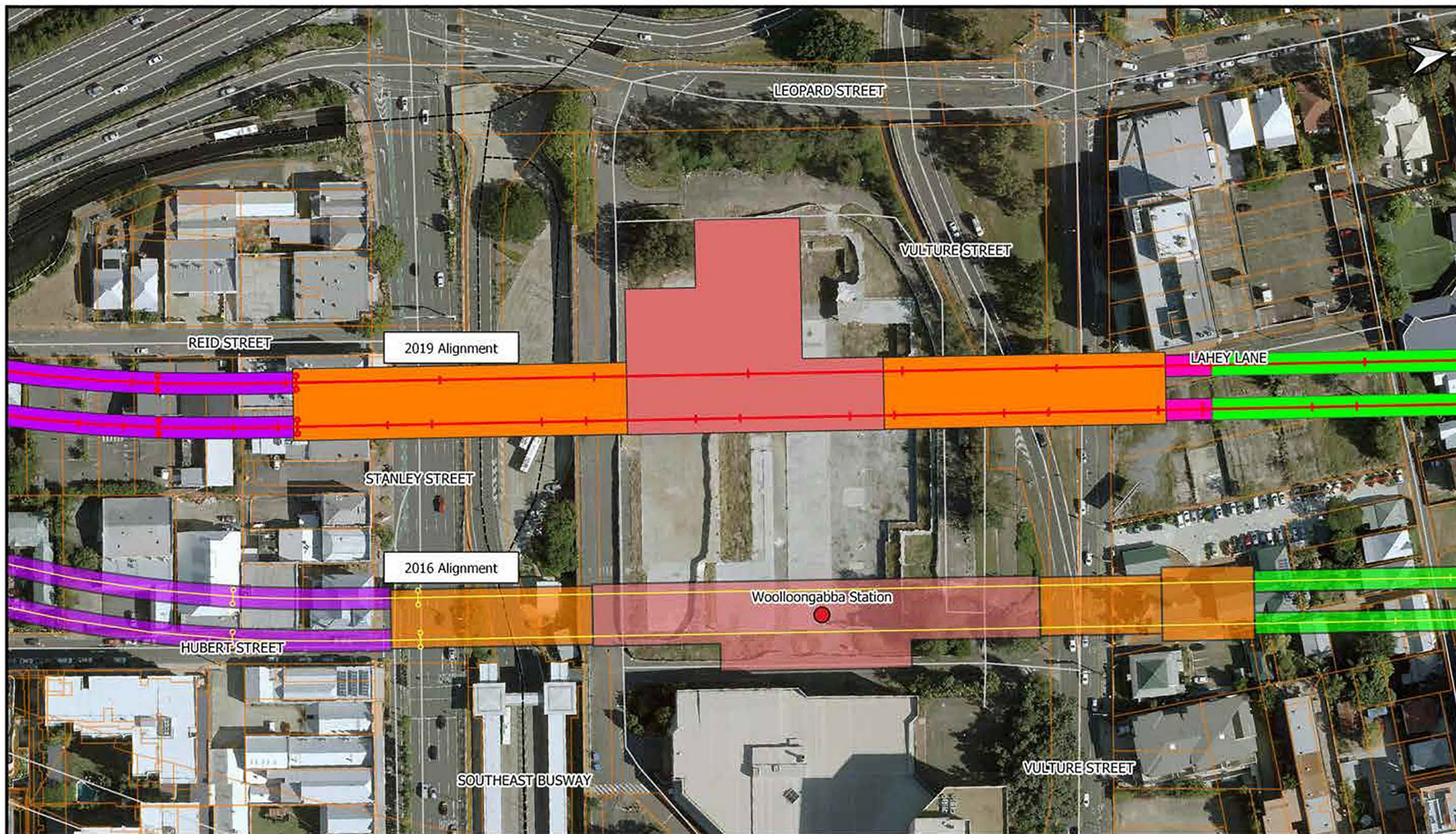


Figure 3.18: Changed Location of CRR Woolloongabba Station

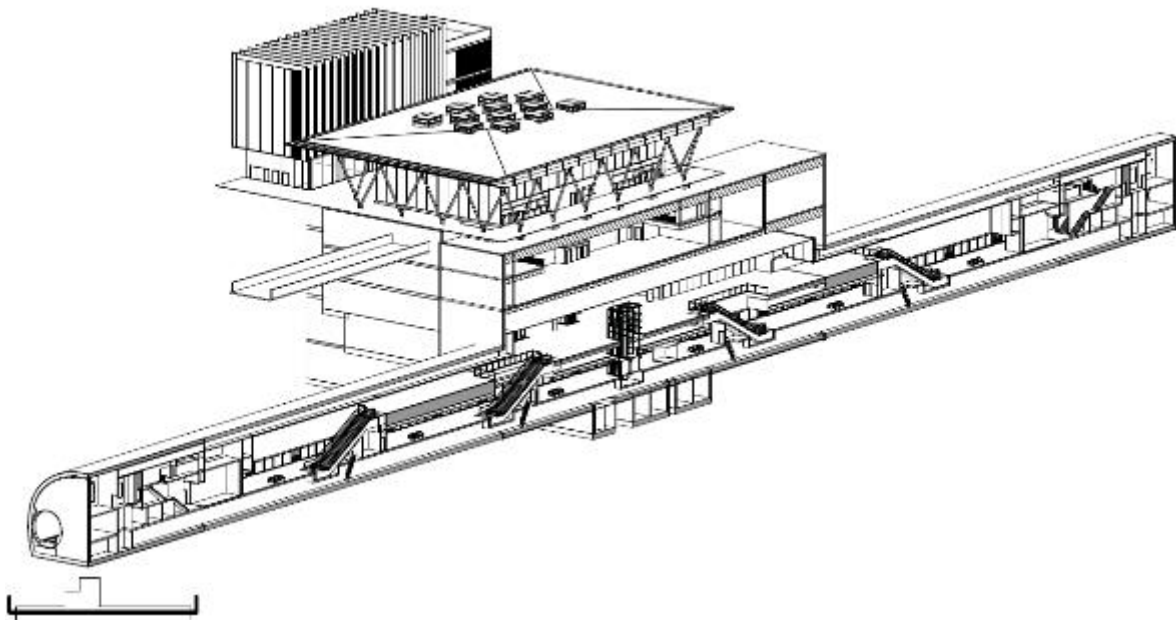
### Legend

2016 Alignment	Existing Rail Network	Property Boundaries	Mined Tunnel	TBM Running Tunnel
2019 Alignment	Roadway	Cross Passage	Mined Cavern	
Underground Station	Busway	Cut and Cover Structure		





*Figure 3.19 Visualisation of the proposed CRR Woolloongabba Station entrance*



*Figure 3.20 General perspective of proposed CRR Woolloongabba Station*

### 3.3.5 Boggo Road Station

The key Proposed Change is the replacement of the proposed pedestrian underpass connection with a new elevated surface pedestrian and cycle link (bridge) from the PA Hospital to the Boggo Road Urban Village. The bridge spans from Joe Baker Street over the existing rail providing a 5.4m clearance and connects with the existing cycleway adjacent to the Boggo Road Busway. Other Proposed Changes to the design of the Boggo Road Station include:

- Lowering the station, extending the station cavern shifting the station box and platforms north by approximately 25m to avoid conflict with the Eastern Busway and freight flyover on the Port of Brisbane line;
- Rail alignment flattened and lowered to create a level platform improving safety and operations; and
- Relocation of plant and services underground minimising ground level area requirements.

Figure 3.21 shows a visualisation of the Proposed Changes to the Boggo Road Station entrance and Figure 3.22 a general perspective of the station.

Due to the lowering of the vertical alignment, a mined cavern construction methodology is now proposed for the northern end of the station box instead of cut-and-cover. This construction method reduces noise, dust and vibration impacts for sensitive receivers.

The mined cavern construction avoids excavation across the busway and the required busway closure as per the cut-and-cover approach in the Evaluated Project. The construction method for the station box and southern station cavern remains cut-and-cover consistent with the Evaluated Project.

An additional area within State owned land fronting Joe Baker Street is required for additional laydown during construction as shown in Volume 2 of this Request for Project Change.

Discussions with the Department of Transport and Main Roads are ongoing regarding the possibility of using the existing busway ramp to enter the worksite. If use of the busway is approved, then additional civil road works are proposed, including construction of heavy vehicle access from Busway for haulage of spoil from the worksite (eastern side of rail corridor). Discussions are also ongoing with BCC regarding the construction of a right-hand turn land from Annerley Road into Peter Doherty Street.



*Figure 3.21 Visual representation of the proposed Boggo Road Station entrance*



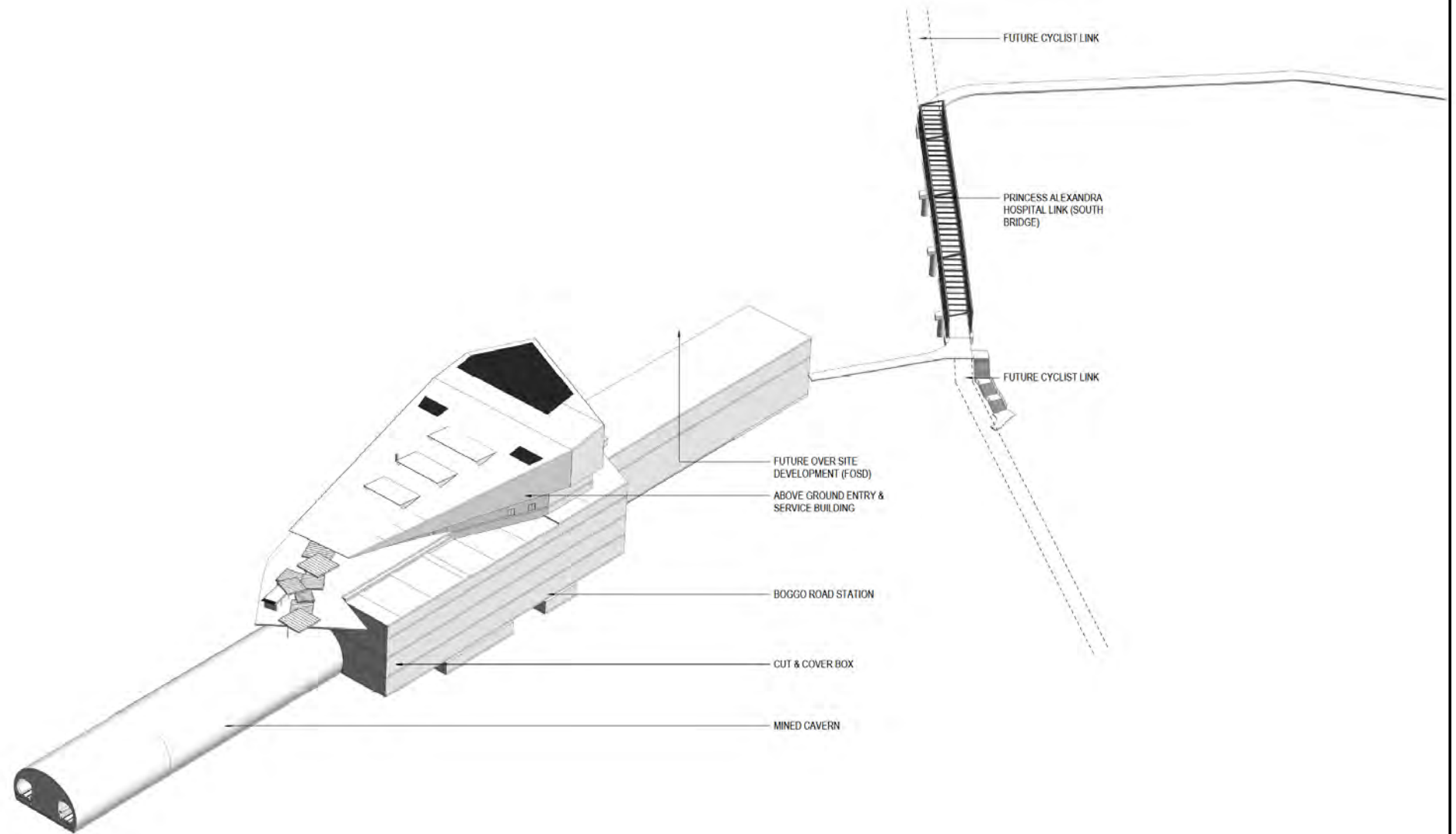


Figure 3.22: General Perspective of Boggo Road Station

### 3.3.6 Southern Portal

The Southern Portal is generally in the same location as the Evaluated Project, however, the Proposed Changes shift the trough structure south approximately 60m on the Up CRR line and 100m on the Down CRR line. This is to avoid the existing freight flyover foundations and achieve a level platform at Boggo Road Station. Compared to the Evaluated Project, the Proposed Changes to the surface tracks at the Southern Portal includes:

- CRR tracks slewed to the east into the area occupied by the QR depot (away from the flyover on the Port of Brisbane freight line allowing the dive structure to be constructed offline);
- Suburban line to CRR line turnouts moved further south to increase the tunnel clearance under the freight flyover and at Boggo Road Station;
- Lowering of the freight down line locally to have cross over with Down CRR line (2% grade); and
- Down Freight line alignment is slewed west to provide space for the Dutton Park Station platform upgrade.

The Proposed Changes incorporate a short-mined tunnel section between the cut-and-cover trough section of the Southern Portal and the Boggo Road southern station cavern under the existing rail infrastructure instead of cut-and-cover construction. The mined cavern approach reduces required rail network closure requirements by allowing offline construction of new suburban tracks, limiting disruption to freight operations and reducing impact to the freight flyover structure. With the portal passing under the freight flyover foundations, underpinning works are required on the flyover structure to reduce constructability constraints. The mined tunnel construction method reduces noise, vibration and dust disruption to surrounding sensitive receptors, the Ecosciences, ESA Leukaemia Village and PA Hospital.

## 3.4 Southern Area

### 3.4.1 Dutton Park Station Upgrade

The Evaluated Project included the upgrade of the existing surface station at Dutton Park. Upgrade works will be generally consistent with the Evaluated Project, although a key Proposed Change is the lengthening of platform to the south of Anerley Road, acquisition of additional properties in Cope Street and the inclusion of a new covered pedestrian bridge south of Annerley Road Bridge. This will improve disability access by providing an integrated pathway for independent access to the upgraded station from catchments via Cornwall Street and Annerley Road and the PA Hospital via stairs and lifts.

Other Proposed Changes to the upgrade design and works at the existing Dutton Park Station compared to the Evaluated Project include:

- A new island platform and one side platform;
- Four retaining walls in and around the station to provide access to the new pedestrian access bridge; and
- The existing noise barrier on the eastern side of the rail corridor south of Annerley Road (starting at Cope Street) would be required to be removed as part of the station upgrade works. For safety reasons, QR require that noise barriers shall not be built behind station platforms or any connecting pedestrian pathways.



Updated station site plans and cross sections are provided in Volume 2 Design Drawing Set.

Similar to the Evaluated Project, the delivery of the station upgrade requires demolition of the existing access ramp, station building, the northern extent of the existing island platform and the side platform off Cornwall Street. The shelters, including the QR heritage listed shelter, will be relocated or demolished. Proposed Changes to the delivery of the Dutton Park upgrade, is the requirement for a temporary platform extension to allow the continued operation of the station during the construction work. This will result in impacts to 2 additional property sites located to the south of Annerley Road. Those properties are zoned as CR2 Character Residential (Infill housing) and comprise a mix of existing stand-alone and multi-unit dwellings.

### **3.4.2 Fairfield to Salisbury Station Upgrades**

As with the Evaluated Project, the Changed Project will involve the operation of CRR trains on the surface between Yeerongpilly and the Southern Portal. To support this operational mode, the Changed Project includes works to surface stations from Fairfield to Salisbury. For the Evaluated Project, these works were to be undertaken as part of a broader network enhancements.

Proposed Changes include works addressing accessibility to the following existing surface stations: Fairfield, Yeronga, Yeerongpilly, Moorooka, Rocklea and Salisbury. This includes a new third platform and raised platform heights to accommodate the Next Generation Rollingstock is proposed at each location, providing an integrated pathway for independent access for each station platform. Whilst arranged in different configurations depending upon the station typology, the components included in the scope for the station assembly will consist primarily of:

- Raising of existing platforms, on either side or in an island configuration;
- New platform canopies erected on the raised platforms;
- Provision of designated accessible parking bays (DAPB) and short-term commuter parking facilities at each station;
- New station buildings which include a ticket office with operational space, staff facilities and accessible staff and customer public toilets, where necessary; and
- Ancillary components including:
  - Pedestrian overpasses including lifts and stairs
  - Balustrade and screens
  - Furniture including seats and bins
  - Signage and wayfinding to the raised existing platforms and new canopies
  - Track maintenance access from the raised existing platforms
  - Bike enclosures
  - QR staff kiosk building (platform refuge).

There are a number of QR heritage listed values across these stations, including overpasses, shelters, station seating and a few station buildings which will be removed, relocated or reinstated in the upgrade. QR will be consulted in relation to the station works.

The architectural design of the works will achieve a consistency across each of the Fairfield to Salisbury stations creating an easily identifiable layout for customers.

### 3.4.3 Surface Works

The Proposed Changes include a number of track reconfigurations and surface works within the rail alignment from Fairfield to Salisbury to improve network operational capacity. These works include:

- Track works north and south of Yeronga Station for additional crossovers;
- Track relocation of Up and Down Suburban lines around Yeerongpilly Station; and
- Removal of the existing diamond crossing at Yeerongpilly and a turnout installed to provide access to the Up-Corinda line from the existing Down Suburban line to improve operations.

Track reconfiguration works at the Tennyson junction at Yeerongpilly is proposed to improve safety and operations. This includes the removal of three diamond crossings, a portion of existing dual gauge and the replacement of a portion of the southern Down Suburban narrow gauge with dual gauge.

### 3.4.4 Clapham Yard Stabling

The 2011 EIS assessed a new stabling facility at Clapham Yard. This included new CRR lines, relocated dual gauge freight lines passing east of the yard to an alignment passing west of the yard, as well as a new train stabling facility as shown in Figure 3.23. This new stabling facility was subsequently removed from the Evaluated Project scope in the RfPC-1. Under the Evaluated Project, Clapham Yard was proposed to be developed and commissioned as part of wider network enhancements, by others.

Stabling facilities at Clapham Yard are required to support network operations across the rail network, including for CRR. Similar to the 2011 EIS design, the proposed works includes the relocation of the dual gauge and dual gauge loop to the west of Clapham Yard, a new rail bridge over Moolabin Creek and new stabling and facilities, as shown in Figure 3.24. Details of the design and delivery aspects of the proposed new Clapham Yard are outlined in Table 3.2.

**Table 3.2. Design and delivery aspects for proposed new Clapham Yard**

Aspect	Proposed Change
Stabling facility	The design includes capacity for a total of 27 stabling roads accommodating slots for both 9 and 6 car train sets. It will also provide one stabling road for graffiti removal suitable for both 9-car CRR train sets and non-NGR train sets. The stabling yard will allow for windscreen and internal cleaning facilities with northern access and restricted southern access for rollingstock  Crew facilities and administration buildings would also be provided as required
Surface tracks	New dual gauge track and dual gauge loop to the western side of Clapham Yard with new turnouts to be installed on the suburban lines to provide access to the new yard. The new dual gauge tracks will carry passengers to the new Moorooka Station Platform.
Rail bridge	One additional track is required across Moolabin Creek with a new single track bridge over Moolabin Creek provided between the existing bridges with the piers aligned to avoid potential afflux issues. These works are similar in nature to that evaluated under the 2011 EIS.
Pedestrian access	Pedestrian access from the surrounding road network and Moorooka Station with a footbridge east to west over the rail corridor.



Aspect	Proposed Change
Access and car parks	<p>Access via the existing signalised intersection of Chale Street onto Fairfield Road. Access to the stabling area will be grade separated with road passing over the dual gauge line</p> <p>Staff facilities located outside the Main lines and car park spaces located adjacent to staff facilities.</p> <p>Rail maintenance access roads.</p>
Surface works	<p>Decommissioning of impacted utility services and building relocations.</p> <p>Removal of the existing overhead power supply along Chale Street and a new 11kV overhead line into site along the new access road.</p> <p>New 11kV underground supply and transformer at the new crew facility.</p> <p>Installation of rail operating systems (fence detection system, CCTV, new communications equipment room, alarm system, intercoms and PA).</p> <p>Overhead power line work and relocation/installation.</p> <p>Track and Civil works including: rail pedestrian and vehicle access, car parking, signs and line marking, road and footpath lighting, security and fencing perimeters, security gates, surface drainage, demolition works, and a Train Crew Facility building.</p>
Fill and flood immunity	<p>The proposed design aims to achieve a cut/fill balance at Clapham Yard and minimise filling in the floodplain. This may result in the stabling roads within the yard not achieving the QR stabling requirement of 1 in 100 AEP flood immunity, however, would prevent reduction in Brisbane River floodplain capacity and significantly reduce the amount of fill required to be imported to Clapham Yard (compared to the 2011 EIS). The rail level of the stabling roads is proposed to be no lower than the mainline rail level over Moolabin Creek which represents a low point on the adjacent existing mainline. All infrastructure, including stabling roads, will be designed and constructed in a manner to be resilient to flooding impacts, with critical infrastructure being designed and constructed to achieve a 1% AEP flood immunity.</p>

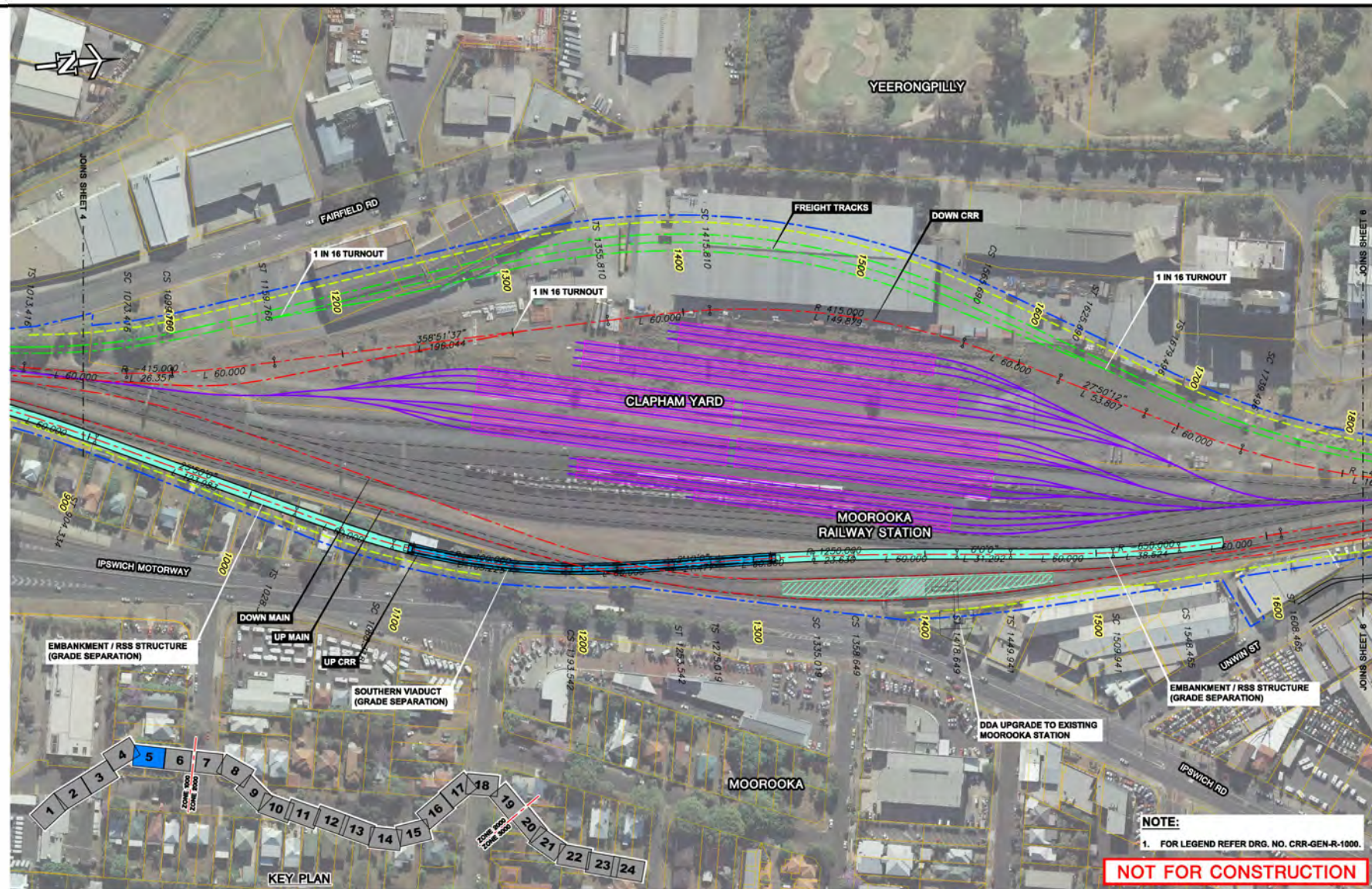


Figure 3.23: Clapham Yard Stabling Facility - 2011 EIS

### Legend

- |                             |   |                     |                              |
|-----------------------------|---|---------------------|------------------------------|
| — Narrow Gauge Track        | — Existing Rail Centerlines To Be Removed | — Rail Access Road  | ■ Embankment / RSS Structure |
| — Dual Gauge Track          | — Train Storage                           | — DCDB Boundary     | ■ Viaduct / Bridge Structure |
| — Yard Tracks               | — Rail Corridor Boundary                  | ■ New Platform      |                              |
| — Existing Rail Centerlines |   | ■ Existing Platform |                              |



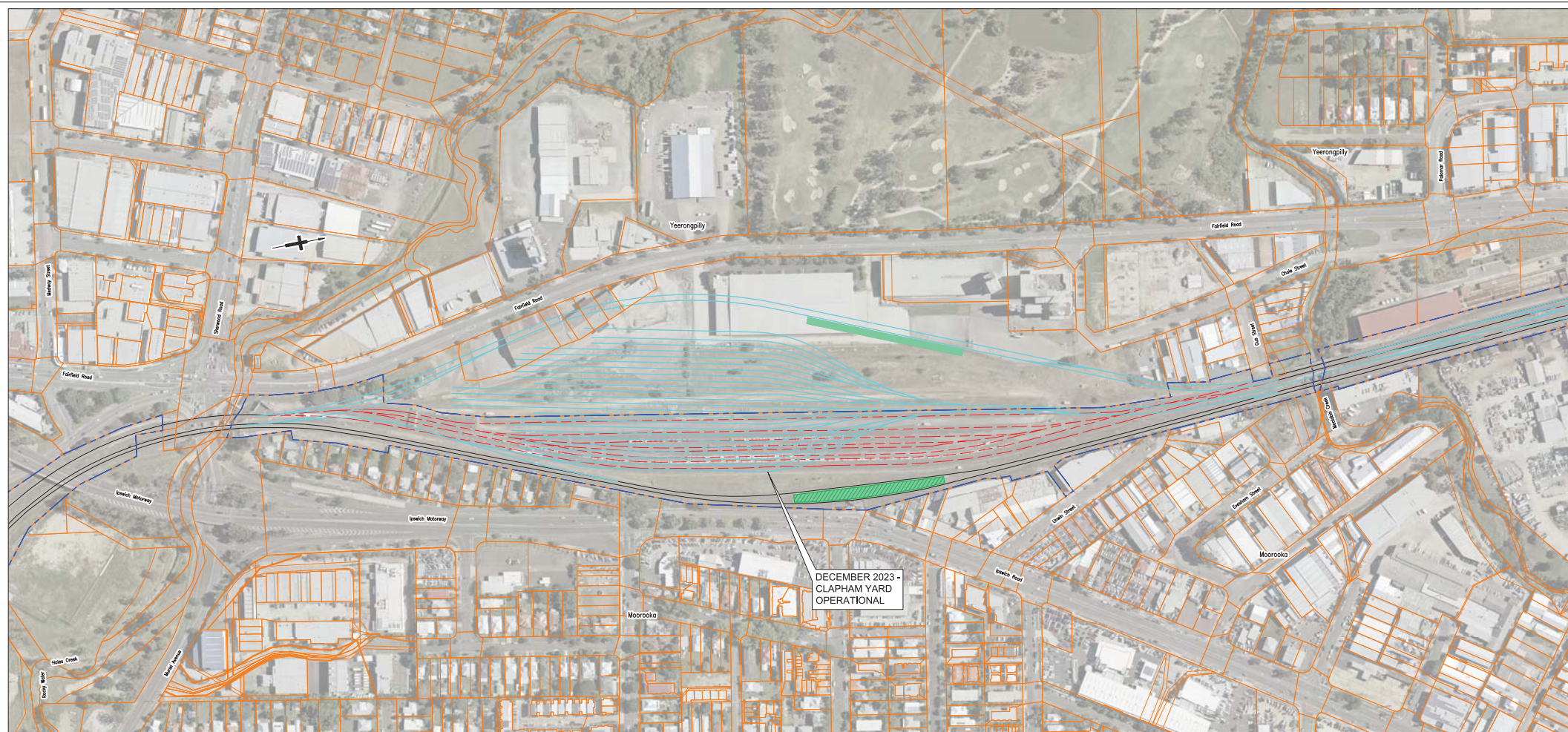


Figure 3.24 - Clapham Yard Stabling Facility - Proposed

#### LEGEND

	CRR TRACK		EXISTING SURFACE PLATFORM
	PROPOSED SURFACE TRACK		CUT AND COVER STRUCTURE
	EXISTING RAIL CENTRELINE		TROUGH STRUCTURE
	EXISTING RAIL CENTRELINE TO BE REMOVED		TBM TUNNEL
	EXISTING STANDARD LOT		MINED TUNNEL
	EXISTING VOLUMETRIC LOT		STATION CAVERN
	RAIL CORRIDOR BOUNDARY		CROSS PASSAGE
	NEW SURFACE PLATFORM		TEMPORARY ADIT / CAVERN

## 3.5 Changes to Delivery

Delivery of the CRR Project would require approximately five years and is anticipated to be completed by the end of 2024. There are no changes to the predicted workforce numbers from the Evaluated Project. Proposed Changes in the delivery of the CRR Project are outlined in this section.

### 3.5.1 Changes to Spoil Handling

Tunnel boring machines tunnelling operations are proposed to commence from the Woolloongabba worksite, generating bulk spoil material movements. Table 3.3 sets out the changes to the predicted spoil volumes generated at each worksite. Overall there has been an increase in spoil volume from Woolloongabba, Boggo Road and Roma Street station caverns, inclusion of the INB relocation works and a general increase across the other worksites.

**Table 3.3. Change in spoil volumes generated at worksites**

Worksite	Evaluated Project <sup>1</sup>	Proposed Changes
Southern Portal	39,000	45,000
Boggo Road Station	119,000	175,000
Woolloongabba Station	470,000	580,000
Albert Street Station	135,000	200,000
Roma Street Station including Inner Northern Busway	112,000	300,000
Northern Portal	65,000	48,000
Mayne Yard	36,000	76,900
<b>Total</b>	<b>0.976 million BCM</b>	<b>1.425 million BCMs</b>
<b>Estimated Trucks (Loads)<sup>2</sup></b>	<b>77,000</b>	<b>114,000</b>

1. Volumes measured in Bank Cubic Metres.

2. The same assumptions identified in the Evaluated Project have been adopted here an assumed truck load equivalent to 12.5 m<sup>3</sup> in-situ material.

### 3.5.2 Construction Worksites and Access

Construction worksites and access are predominantly at the locations nominated in the Evaluated Project; however, the Proposed Changes are:

- Changed Victoria Park construction access to the Northern Portal with signalisation on Gregory Terrace;
- Changed Exhibition Station worksite location within the RNA showgrounds;
- Additional Albert Street construction worksite for the northern station entrance;
- Additional laydown area at Boggo Road Station on State land adjacent to busway; and
- Additional worksite predominantly within the existing rail corridor at each of the Fairfield to Salisbury stations for the upgrade works.

Revised drawings showing the areas impacted during construction are provided in Volume 2 of this Request for Project Change.



### **Mayne Area**

The Evaluated Project had one worksite compound within Mayne Area, within the southern end of Mayne Yard North. The Proposed Changes require two worksite compounds within Mayne Yard to facilitate the increased constructions works:

- North worksite – located at the northern end of Mayne Yard to west of current rail lines adjacent to Breakfast Creek which will have access from the north and south;
- West worksite – abutting Breakfast Creek on the western side of the yard immediately north of the Ferny Grove Flyover structure with access from both the north east and south.

### **Victoria Park**

The Evaluated Project includes an upgrade to an existing vehicle track through Victoria Park for construction access to the rail corridor via the BCC compound. A revised construction access through Victoria Park is proposed which would still be accessed from Gregory Terrace but with an alternative route through the park. The Proposed Changes require the demolition of the existing Department of Health Biomedical Technology Services building. This area will be used as a construction access and temporary worksite or laydown.

Proposed Changes to the construction access are in response to consultation with technical specialists and stakeholders including Department of Health (including Biomedical Technology Services), Energex and BCC. The proposed access has been developed in response to several key site constraints, including: safety issues, landscape and cultural heritage values, maintenance of local access for QR, Energex and utility easements, the new Inner City Bypass on-ramp and maintenance of access for cyclists and pedestrians.

### **Exhibition Station Worksite**

The worksite within RNA has been relocated within the showgrounds and fronting O'Connell Terrace to minimise impacts to the showground operation. This worksite will provide approximately 64 construction car parks and contain a laydown area and a construction satellite office. Construction access will change during construction staging and any access routes through the RNA showgrounds and periods of use will be developed in consultation with the Royal National Agricultural and Industrial Association.

### **Roma Street Satellite Worksite**

In the Evaluated Project, a number of worksites were located at Roma Street. These include: a satellite worksite at the College Close carpark within the Roma Street Parklands, the main station construction worksite located at the Brisbane Transit Centre site, and a temporary use of a part of Lot 60 west of Parkland Boulevard for 12 months to support the demolition works.

The Proposed Changes seek to have only one main construction worksite and thus will remove the satellite worksite from the CRR Project due to:

- Its limited practical benefit due to its separation from the Roma Street construction site; and
- previous concerns raised in public submissions to the EIS and other requests for project change as well as ongoing stakeholder engagement.

The Proposed Changes, particularly the underground Roma Street section of the INB construction requirements increase the temporary worksite area compared to the Evaluated Project.

Compared to the Evaluated Project, temporary construction will extend to include part of Parkland Boulevard and Emma Miller Place. Once construction is completed, Emma Miller Place will be fully reinstated to its previous condition.

Multiple worksite access points along Roma Street are proposed for heavy and light construction vehicles. The construction of the Roma Street section of the INB would require cut and cover tunnel works to the east of Roma Street Station across Parkland Boulevard and through Emma Miller Place. Temporary staged occupation of Parkland Boulevard access near the roundabout from Roma Street is required during construction, in order to maintain access at Parkland Boulevard. Coach access to the relocated coach terminal will also need to be maintained along Parkland Boulevard.

### **Albert Street Station Worksite**

The Albert Street Station delivery will require an additional worksite at 142 Albert Street for the construction of the new northern station entrance. Works will include demolition of existing buildings, spoil excavation and shaft construction works. Construction vehicle traffic access, for the southern station entrance, via George Street, Margaret Street, Mary Streets and Albert Street. Egress to the Riverside Expressway via Alice Street. Construction vehicle traffic access, for the northern station entrance, via Elizabeth and Charlotte Streets and egress to the Riverside Expressway via Albert Street and Alice Streets is proposed and will be further developed in consultation with BCC.

### **Southern Area**

**Dutton Park Station** - The Dutton Park Station proposes a construction access via Cope Street, which will require additional property acquisition.

**Fairfield Station** - A new satellite worksite is required at Fairfield Station for the upgrade works. The worksite will be located within the QR corridor next to the station off Equity Street and a site access and delivery area will be provided off Mildmay Street. The worksite will include satellite offices and facilities and will be fenced with three access points along Equity Street. The worksite is required for a period of approximately 16 months.

**Yeronga Station** - The proposed new satellite worksite for the Yeronga Station upgrade will contain a crib hut, toilets, change room and office. Access to the worksite will be via the north west of the station through the existing commuter car park and QR access gate. Nightshift access will be via the east of the station. Ten car parking spaces will be occupied during construction; however, additional spaces will be created within the existing car park to offset the impact and retained as a legacy on completion of the Project. The worksite is required for a period of approximately 17 months.

**Yeerongpilly Station** - A new satellite worksite is required on the eastern side in the rail corridor within a security fenced area providing delineation from the rail corridor. The worksite will contain crib hut, toilets, change rooms, office space and five parking spaces and be required for a period of approximately 15 months. Due to the limited space around the station, a maximum of 12 commuter parking spaces will be temporarily used for construction purposes and returned progressively to the public. These parking spaces will be offset along Wilkie Street alongside the work zone.

**Moorooka Station** - The main project office for the Fairfield to Salisbury station upgrade works will be at Moorooka Station, accessed from Chale Street. The worksite will contain office accommodation for up to 20 people, meeting rooms, crib huts, change room, first aid facility, and storage facilities for a period of approximately 38 months. Construction access to Moorooka Station will be predominantly from the west via existing QR land with limited temporary access required from the east off Ipswich Road. The interface of construction vehicles with the busy Ipswich Road will be managed via a work zone setup, which provides for improved construction efficiency and safety, limiting the interface with running trains and providing the required construction access.

**Rocklea Station** - The satellite office will be located east of the station on existing QR land. It will contain crib hut, toilets, change room and office. The temporary site facilities and laydown area within the rail corridor and existing commuter car park and will be enclosed with a security fence. The worksite is required for a period of approximately 14 months. Construction access from the east will be via the existing QR land outside the rail corridor and from the west through the existing commuter car park.



Commuter car parks adopted to allow safe access will be offset in the adjacent upgraded car park. Approximately 42 additional parking spaces will remain after the construction of the Project as legacy.

**Salisbury Station** - The satellite office will be located in the existing rail corridor off Dollis Street and will contain crib hut, toilets, change room and office. The temporary site facilities and laydown area are within the rail corridor. The worksite is required for a period of approximately 15 months. Construction access will be predominantly via the west to mitigate noise and public interactions during construction. Site parking will be provided within the worksite for the construction crew and visitors. There will be no construction worksite parking along Dollis Street and no commuter car parks will be affected by the works.

The nominated worksites for the upgrades of the Fairfield to Salisbury stations are located within the rail corridor or within road easements and have no direct impacts to commercial and residential buildings. Delivery of these station upgrades will require multiple work fronts across several stations at any one time with upgrades being delivered.

### 3.5.3 Cumulative Construction Impacts

There is also a significant level of cumulative interfaces and construction impacts from development projects planned, proposed and under construction in Brisbane. The Delivery Authority is a member of the Brisbane City Centre Coordination Steering Group (BCCCSG) whose key role is to monitor the status and potential issues from significant projects within the inner 5kms of Brisbane, specifically within areas of major growth and investment, including suburbs in the City Centre Master Plan and those with planned major new transport infrastructure such as Cross River Rail and Brisbane Metro.

Haulage and delivery constraints from cumulative construction was identified by the BCCCSG as having key risks to safety, city transport operations and noise and vibration impacts. In response, a number of Traffic and Transport Working Groups were established.

The CRR Transport Integration Group (CRR TIG) comprises nominated senior CRR, Department of Transport and Main Roads, QR and BCC representatives and operates predominately at a tactical level. The key focus of the CRR TIG is to provide oversight of cross-organisational issues that require collaboration to achieve a best outcome for city and State. Whilst decision making remains within the existing Leadership Groups, the CRR TIG can be utilised to achieve organisation consultation prior to escalation to respective Steering Committees. The CRR TIG's role is to assess transport/traffic impacts to public generated by CRR (with cumulative considerations from the Brisbane Metro project) and focus on:

- CRR Public transport user impacts specific to Roma Street, Woolloongabba, Boggo Road/Dutton Park and Exhibition Precinct;
- Road user impacts (as specified above);
- Active transport user impacts (cyclists, pedestrians, etc);
- CRR/Brisbane Metro construction impact management and coordination for transport and traffic matters;
- Operational readiness coordination; and
- Schedule coordination for transport and traffic matters.

The CRR TIG will provide recommendations to project proponents for established coordination areas with regard to the management of public transport, traffic, pedestrians and construction haulage.

## 4. Environmental Management Framework

### 4.1 Environmental Management Plans

The CRR Project would be designed and implemented in accordance with the approach reflected in the Imposed Conditions, which entails:

- Environmental design requirements;
- Environmental management requirements in project delivery; and
- Application of existing environmental protocols and procedures for the operating rail network.

The Outline Environmental Management Plan (OEMP) for the CRR Project has been approved by the Coordinator-General and provides the overarching framework for the Project's environmental management requirements. The OEMP was approved by the Coordinator-General on the 18 December 2018 and is available on the CRR Project website:

<https://crossriverrail.qld.gov.au/info/planning-and-environment/>

The OEMP identifies each environmental element potentially impacted by Project construction and commissioning and sets the required environmental outcomes to be achieved, and performance criteria to meet the environmental outcomes. The OEMP identified possible mitigation measures that may be applied in the event that the performance criteria cannot be met. The OEMP also nominates monitoring and reporting requirements to be delivered for the construction and commissioning of the Project.

Construction Environmental Management Plans will be developed by the principal construction contractors prior to commencing relevant project works, in accordance with the Imposed Conditions. The Environmental Monitor will endorse the Construction Environmental Management Plans where they are consistent with the approved OEMP.

### 4.2 Environmental Design Requirements

The Coordinator-General's Imposed Conditions require that the project achieve the environmental design requirements set out at Schedule 1 of Appendix 1 in the Coordinator-General Change Report dated March 2019. The environmental design requirements establish the design requirements that the project is intended to achieve in the operational phase. The environmental design requirements address potential operating effects of the Project on the receiving environment including the local transport network, groundwater, ground settlement, noise and vibration, air quality, cultural heritage, landscape and visual amenity, land use, social, climate change and sustainability. No changes are required to the Environmental Design Requirements as a result of the Proposed Changes.



## 5. Reasons for Proposed Changes

The core justifications for the CRR Project remain the same as the Evaluated Project, in that it will increase the capacity of the rail network to meet SEQ's future transport needs, unlock the potential for enhanced integration of rail with other transport modes and accelerate sustainable regional growth and urban revitalisation.

The reasons for the Proposed Changes are presented in this section and generally relate to:

- Changes to the responsibility for and timing of delivery for a number of complementary and associated network enhancements,
- Changes to Mayne Yard augmentation works to accommodate Cross River Rail and wider network operating requirements, incorporation of rail network upgrades and enhancements, including Clapham Yard augmentations and upgrades to stations from Fairfield to Salisbury;
- Opportunities for co-location with Brisbane Metro stations;
- Integration of the Roma Street section of the Inner Northern Busway;
- Innovations and improvements deriving from the request for proposals (tender) process, including:
  - different construction methods at Roma Street, Albert Street and Boggo Road stations leading to some reduced construction impacts;
  - different construction methods in the stations and the tunnels to provide greater confidence in the delivery schedule;
  - rearrangement of surface tracks and stabling areas, and project alignments leading to operational improvements for the surface network and the Changed Project;
  - rearrangement of Roma Street, Albert Street, Woolloongabba and Boggo Road stations to facilitate improved interfaces with high quality public transport and urban development outcomes;
  - rearrangement of the Exhibition Station to provide an enhanced passenger experience and connectivity with the RBWH campus, RNA and development adjacent to RNA.
- Enhancing value for money for whole of life CRR Project, through reduced maintenance costs and improved operational efficiencies.

### 5.1 Project Delivery Model

Initially, the Department of Transport and Main Roads was the proponent for the CRR Project. The Delivery Authority is now the proponent for the Project and was established by the *Cross River Rail Delivery Authority Act 2016*. The Delivery Authority became operational on 14 April 2017. The role of the Delivery Authority includes leading the development, procurement and delivery of the CRR Project and associated prescribed 'transport-related projects'. The Delivery Authority is to also support wider community outcomes by taking responsibility for economic and community development in Cross River Rail Priority Development Areas.

A delivery model was developed based on project-specific considerations and potential packaging options. This resulted in two major packages of work; a Rail, Integration and Systems Alliance (RIS) and a Tunnel, Stations and Development (TSD) public-private partnership (PPP).

The Delivery Authority selected two preferred tenderers to undertake the project. As a result of innovations and enhancements through the request for proposals process, a number of design and delivery changes have been identified for the Project, including proposed minor changes to the Imposed Conditions. On 4 April 2019, the Queensland Government announced its approval of the preferred contractors, being Unity Alliance to deliver the RIS package and the Pulse consortium to deliver the TSD package of works.

## **5.2 Public Transport Network Integration**

### **5.2.1 Co-location with Proposed Brisbane Metro**

The complementary nature of the proposed Brisbane Metro and the CRR Project will help achieve greater integration of the public transport network and enhanced customer service and satisfaction than either project on its own.

The Changed Project will provide interchange opportunities with the proposed Brisbane Metro at Roma Street station and Boggo Road station, extending a regional service to key activity centres such as Brisbane's Cultural Centre, South Bank, the Mater Hospital and Queensland Children's Hospital, and the University of Queensland. Enhanced connectivity for these centres will realise long-term community, social and economic benefits.

Impacts and interdependencies of both projects were considered in the Brisbane Metro Business Case (May 2017) which was developed by BCC. The Delivery Authority has been working with the BCC to ensure an appropriate level of planning and coordination as the two projects are implemented. The Proposed Changes have considered and adopted design changes to provide co-location opportunities with the proposed Brisbane Metro at the Boggo Road Station, and Roma Street Stations.

### **5.2.2 Integration with Inner Northern Busway**

The Changed Project will include works to integrate the Roma Street section of the INB corridor and station at Roma Street. The INB station will connect with the CRR station at Roma Street, aiding trip transfers especially for passengers from the RBWH campus and the QUT (Kelvin Grove) campus. Interchanging at Roma Street will provide accessibility for regional communities to these two important activity centres. Travellers on the Changed Project could also transfer, at Roma Street, to the busway network to access either Queen Street, or the Cultural Centre and South Bank, similar to the Brisbane Metro.

Beyond the station, the INB will be extended underground, in a cut-and-cover construction, to join with the King George Square and Queen Street busway stations.

This degree of integration will provide choice and flexibility across the CBD and inner city for both local and regional trips.

## **5.3 Reasons for Changes Within CRR Project Areas**

### **5.3.1 Mayne Area**

During construction, the Evaluated Project alignment would impact on QR operations and facilities, assets and infrastructure within Mayne Yard. During operations, the Evaluated Project would impact on network operations. The reasons for the Proposed Changes within the Mayne Area, including changes to the alignment and requirement for a new rail bridge are:

- accommodate Cross River Rail and wider network operating requirements;



- to minimise the extent of modification to existing facilities and track, reducing interruptions to existing Mayne Yard rail operations during CRR Project delivery;
- to avoid the need for a trough structure and rail underpass across live rail track adjacent to Mayne Yard East;
- to reduce the number of construction interfaces with the live rail corridor, reducing safety and programming risks for construction; and
- to allow train speeds of 60 to 80km to be achieved safely through this area improving network operation and reliability.

Mayne Yard East stabling facilities are required to provide enhanced capacity and flexibility to network operations.

The Mayne Yard East will be used to stable trains arriving from the south via CRR. A graffiti removal road is not required in Mayne East as this activity will be undertaken at the proposed Clapham Yard stabling facility. The relocation of a 'graffiti road' will allow for the CRR main lines to be installed.

With the use of Mayne Yard East stabling for the CRR services, changes to the stabling facility is required to stable trains coming through the city from the west. The Proposed Changes include changes to the stabling facility at Mayne Yard North.

With the Evaluated Project, the CRR main tracks merged with the main lines south of Breakfast Creek and relied upon the existing central and eastern creek crossings. While the proposed realignment of the CRR main tracks through Mayne Yard will alleviate some of the delivery issues for the operating network, it requires a new crossing over Breakfast Creek. The proposed realignment will also allow CRR trains to move through and beyond Mayne Yard safely and at speed. The main tracks for the Changed Project extend beyond Mayne Yard and Breakfast Creek to join with the main Northern Line south of Albion station and the Albion Overpass.

### **5.3.2 Northern Area**

The worksite for the Evaluated Project in the Northern Area required vehicular access from Gregory Terrace, through Victoria Park, and from Bowen Bridge Road. The likely impact on Victoria Park was of concern for submitters to the Evaluated Project, particularly in regard to the loss of a number of mature trees.

The proposed change to the construction access through Victoria Park is in response to consultation with contractors, technical specialists and stakeholders including Energex, BCC and Queensland Health Biomedical Technology Services). The reasons for the changed access arrangements requested include:

- The Energex site is a critical main network control centre and CBD sub-station for SEQ. Energex have safety and security concerns regarding the previously proposed heavy vehicle access from the project worksite to the newly constructed Inner City Bypass ramp.
- The acquisition and demolition of the Biomedical Technology Services building is in response to concerns raised by Biomedical Technology Services about loss of land, staff safety, parking and access during construction. Acquisition of this building will allow relocation and avoid impacts on the Biomedical Technology Services operation and services.
- To prevent conflicts with the Victoria Park 2014 Master Plan as the BCC depot was 'earmarked to be an open area for informal sports and community use with additional park infrastructure such as playground equipment and parking'.

- The chosen route minimises impact to trees with retention value and identified habitat trees and breeding places.

The Proposed Changes to the northern portal works (cut-and-cover structure and trough structure) are minor and unlikely to result in impacts on the adjacent school site greater than the Evaluated Project. The changes to the alignment of surface tracks within the rail corridor are required to accommodate the portal structures while maintaining network operations. The relocation works within the rail corridor will be closer to the school than the surface track for the Evaluated Project. While the change in alignment will be closer to the school the advantages to the operating network during project construction are considerable. They allow the rail corridor to continue functioning, especially during the AM peak when trains need to turn back from Roma Street to Mayne Yard.

### 5.3.3 Central Area

The Changed Project has minor variations to the main tunnel alignment and a consequential realignment of Roma Street station and Woolloongabba station. Compared to the Evaluated Project, the Changed Project will improve the tunnel vertical and horizontal alignments, providing a straighter tunnel.

A straighter and faster tunnel alignment:

- allows trains to maintain 80km/hr through the tunnels and reduces journey time, within the project area. This improvement in overall transit time will provide inbuilt resilience in the system to manage reasonable delays, maintaining train operations under peak hour conditions;
- reduces whole of project life costs for QR;
- reduces operational noise generated from cornering on the approaches to Roma Street station. Consequently, maintenance issues and costs associated with cornering will be reduced, albeit slightly;
- reduces the number of volumetric acquisitions required from 195 to 152 sites; and
- increases the separation to sensitive receptors in Roma Street, including the law courts complex, reducing potential noise, vibration and settlement impacts.

#### Roma Street Station

The reasons for changing the construction method from cut and cover to a predominantly mined station cavern is to delink station construction from demolition works, reducing scheduling and delivery risk. The temporary construction access shaft located offline allows road header excavations to start without waiting for demolition of the Brisbane Transit Centre and Hotel Jen.

#### Roma Street section of INB

The proposal to realign the Roma Street section of the INB as part of the Changed Project is requested for the following reasons:

- Following commissioning of the CRR Project, Roma Street will become South East Queensland's most integrated transport hub, offering rail services from all three Citytrain sectors, long-distance Queensland Traveltrain services, interstate standard gauge services, both dedicated Brisbane Metro (bus) lines and long-distance coach services.
- The Roma Street section of the INB was originally built in 2008 as a bus solution that responded to existing constraints through the Roma Street and Brisbane Transit Centre precincts.



Constraints included clearances over the Parklands Boulevard and the need to fit platforms between building foundations and other QR assets.

- These constraints resulted in a sub-optimal busway with platforms shorter than required standards.
- Over 2,000 daily bus services use the INB, and these services are constrained by operational inefficiencies because of vertical grades, and sub-optimal platform lengths.
- Approximately 19,000 passenger movements occur at Roma Street busway station per day, with more than 50 percent being transfers onto passenger rail (~ 9,900 pax/day). Forecasts estimate passenger movements in 2026 will be approximately 49,900 per day through Roma Street busway with 35,790 (approximately 70 percent) transferring from bus to rail.
- Relocating the Roma Street section of the INB provides opportunities for increased accessibility to the Roma Street precinct, and accommodates possible future transformation of the Roma Street precinct into a key attraction as Brisbane emerges as a new world city.

Overall, with the Roma Street section of the INB works, the surface construction impacts in the Roma Street Station precinct have increased in area and duration. However, the changed construction methodology minimises the cumulative impacts of delivering this element of the project as well as the relocated section of INB by reducing surface works for the underground rail station delivery.

### **Albert Street Station**

The reasons for the design change to consolidate the multiple street entrances into two plaza station entrances are:

- by removing street structures from the roadway and adjacent footpaths, the Project complements BCC's Albert Street Vision, with the plaza entrances providing a public space to incorporate design elements of the project; and
- A separate northern access provides for improved passenger loading/unloading and improves access from different parts of the CBD.

The change of the construction methodology to two smaller shafts and a fully mined station cavern is requested to:

- reduce surface construction impacts of noise, dust and vibration and construction traffic;
- achieve the Coordinator-General's recommendation 5 to avoid the relocation or temporary closure of the Myer Centre carpark ramp; and
- minimise the need to relocated multiple existing utility services.

### **Woolloongabba Station**

The proposed Woolloongabba Station is some 70m to the west of the site identified in the Evaluated Project. The benefits from the relocation include:

- a straighter tunnel alignment with improved operating functions and reduced operating costs;
- an extended area between the station and The Gabba, enhancing the capacity to manage station loading and unloading during events. This leads to flow-on benefits in reduced crowding and improvements in crowd behaviour around the station precinct;

- enhancing the opportunity to integrate The Gabba event day pedestrian connections with a potential 'Station to Stadium' connection over Main Street; and
- improved opportunities to provide for improved precinct outcomes in the proposed Woolloongabba Cross River Rail Priority Development Area.

The design change to reduce station entrances into a single plaza facilitates the development of a more cohesive precinct, integrating a major sporting facility with a major transport hub, creating a gateway experience for event days and defines a heart for the regeneration of the station precinct.

### **5.3.4 Boggo Road / Dutton Park Area**

The Changed Project proposes to relocate the proposed Boggo Road station further to the north-west of the site compared to the Evaluated Project. The station platform will be approximately 2 metres lower than that of the Evaluated Project. These changes will realise a number of benefits in both the construction and operation of CRR, including:

- Constructing the station by a combination of cut-and-cover and mining to minimise the disruption to surface rail traffic through Park Road station;
- The lower tunnel alignment north of Boggo Road station will result in reductions in construction impacts, such as noise and vibration;
- Improved horizontal and vertical alignments will reduce operational noise and vibration, and result in reduced operating costs; and
- An elevated pedestrian / cycle link connecting the Ecosciences Precinct and the PA Hospital campus.

Similar to the Evaluated Project, the Changed Project results in the loss of Outlook Park. The possible relocation of Outlook Park remains a matter to be resolved jointly with BCC as part of a broader Boggo Road precinct planning process.

The elevated pedestrian / cycle connection between Ecosciences and the PA Hospital campus is a significant improvement from the underground connection provided for in the Evaluated Project, reducing the public safety and management concerns associated with an underground connection.

The Changed Project will not provide a direct pedestrian infrastructure connection between the underground Boggo Road station, Park Road Station and the Boggo Road busway station. This change will reduce the construction costs and disruption of construction on the live station, rail corridor and busway.

### **5.3.5 Southern Area**

#### **Surface Station Upgrades**

As described in Request for Project Change 1, as part of normal network operations, enhancements would be delivered across the wider railway network. This included upgrades and provision for a third platform at some of the existing surface stations from Fairfield to Salisbury to enable the Dual Gauge track to be used for all stop passenger services.

The Evaluated Project shortened the project by bringing the southern portal from Yeerongpilly to north of Boggo Road and the platform works in the southern corridor works were to be performed as a separate activity within the scope of overall network improvements delivered by QR. The changed delivery model now brings the southern corridor works into the CRR project.



The reasons for the changes to include the southern corridor works includes:

- Delivery of these works is now the responsibility of the Delivery Authority; and
- Delivery of the proposed works under Cross River Rail will also provide a consistent design and legibility across the southern stations from Fairfield to Salisbury.

### **New Stabling Facilities**

As presented in Request for Project Change 1, train stabling is being increased progressively to accommodate new passenger trains through a QR Stabling Program. A new stabling facility at Clapham Yard and works in the existing facility at Mayne Yard will support CRR and wider network operations. The changed delivery arrangements now bring the Clapham Yard stabling works into the CRR Project.

## 6. Effects of the Proposed Changes

This section summarises the environmental effects of the Proposed Changes. Further details on each of the effects of the Proposed Changes are provided in the technical reports within Volume 3. The technical reports provide details of the environmental values present in the new areas impacted by the changes, assess changes to impacts in areas where alignment or works have changed and present the new or changed mitigation measures required to ensure the environmental effects can be appropriately managed and meet the Coordinator-General's Imposed Conditions. Table 6.1 outlines the key changed aspects and the level of assessment undertaken for the Proposed Changes.

**Table 6.1. Key changed aspects and the level of impact assessment**

Changed Aspect	Summary of Change	Level of Impact Assessment
<b>Mayne Area</b>	<ul style="list-style-type: none"> <li>CRR track alignment change</li> <li>New Mayne Yard North stabling facility</li> <li>New Breakfast Creek rail bridge and track work to just south of the Albion overpass</li> <li>Road over rail access road to Mayne Yard North</li> <li>Adjustments to Mayne Yard East stabling</li> </ul>	<p>Quantitative assessments completed:</p> <ul style="list-style-type: none"> <li>air dispersion modelling using the CALPUFF dispersion model</li> <li>noise modelling using SoundPLAN 8.0</li> <li>preliminary contaminated land assessment.</li> <li>hydrologic and hydraulic modelling using TUFLOW models</li> <li>fauna, flora and weed surveys</li> </ul> <p>All other aspects qualitatively assessed.</p>
<b>Northern Area</b>	<ul style="list-style-type: none"> <li>Construction access through Victoria Park realigned and signalisation on Gregory Terrace</li> <li>Exhibition Station worksite relocated</li> <li>Surface tracks near Northern Portal realigned</li> <li>Civil structural works defined</li> </ul>	<p>Quantitative assessments completed:</p> <ul style="list-style-type: none"> <li>noise modelling using SoundPLAN 8.0</li> <li>fauna, flora and weed surveys</li> <li>preliminary contaminated land site investigation (Northern Portal)</li> <li>settlement</li> </ul> <p>All other aspects qualitatively assessed.</p>
<b>Central Area</b>	<ul style="list-style-type: none"> <li>Straightened and optimized tunnel alignment</li> <li>CRR Roma Street Station location, design and construction methodology</li> <li>Integration of the Inner Northern Busway into the underground Roma Street Station</li> <li>Removal of Roma Street Satellite worksite.</li> <li>CRR Albert Street Station design and construction methodology</li> <li>CRR Woolloongabba Station design and location</li> <li>CRR Boggo Road Station design, construction methodology and pedestrian and cycle overpass replace underpass</li> <li>Southern Portal slightly shifted.</li> </ul>	<p>Quantitative assessment completed:</p> <ul style="list-style-type: none"> <li>settlement,</li> <li>air dispersion modelling using the CALPUFF dispersion model</li> <li>for Roma Street and Woolloongabba,</li> <li>noise modelling using SoundPLAN 8.0</li> <li>hydrologic and hydraulic modelling for underground stations.</li> <li>traffic impacts at Roma Street, Albert Street and Boggo Road using SIDRA modelling.</li> <li>fauna, flora and weed surveys</li> <li>preliminary contaminated land site investigation (Boggo Road, Albert Street, Roma Street).</li> </ul> <p>Qualitative assessment of all other aspects.</p>
<b>Southern Area</b>	<ul style="list-style-type: none"> <li>Dutton Park Station upgrade design and new pedestrian connection to the PA Hospital</li> <li>Surface track works</li> </ul>	<p>Quantitative assessments completed for Dutton Park and Southern Portal:</p> <ul style="list-style-type: none"> <li>air dispersion modelling using the CALPUFF dispersion model for Boggo Road and Southern Portal.</li> </ul>



Changed Aspect	Summary of Change	Level of Impact Assessment
	<ul style="list-style-type: none"> <li>New platforms and upgrades to Salisbury, Rocklea, Moorooka, Yeerongpilly, Yeronga and Fairfield stations</li> <li>New stabling facilities at Clapham Yard</li> <li>New rail crossing of Moolabin Creek</li> </ul>	<ul style="list-style-type: none"> <li>noise modelling using SoundPLAN 8.0</li> <li>hydrologic and hydraulic modelling using TUFLOW models</li> <li>fauna, flora and weed surveys</li> <li>preliminary contaminated land site investigation</li> <li>settlement</li> </ul> <p>Qualitative assessment of all other aspects.</p> <p>Quantitative assessments completed for Clapham Yard and F2S Station upgrades:</p> <ul style="list-style-type: none"> <li>noise modelling using SoundPLAN 8.0</li> <li>hydrologic and hydraulic modelling using TUFLOW models</li> <li>revision of air dispersion for 2011 EIS</li> <li>traffic assessments</li> </ul> <p>Qualitative assessment of all other aspects.</p>

## 6.1 Property

The Evaluated Project required a total of 224 properties to be acquired, comprising of 29 properties for surface works and 195 required for volumetric acquisition. At the time of the 2011 EIS assessment, a total of 412 properties would have been impacted by a whole or partial acquisition. Of these, 108 properties were required for surface works and 304 were volumetric acquisition for underground tunnels and stations.

The Proposed Changes require 18 additional surface acquisitions and a reduction of 43 volumetric acquisitions required under the Proposed Changes. Overall the acquisition of 25 less properties are required compared to the Evaluated Project. A breakdown of surface and volumetric property requirements by land use type is provided in Table 6.2.

**Table 6.2. Number of properties required by land use type**

Property Site Type	2011 EIS	RfPC1	RfPC1+3 <sup>1</sup>	RfPC4
Surface – residential	39	0	0	2
Surface – commercial/industrial	60	15	17	30
Surface – other (park, etc)	9	14	14	17
<b>Total surface property sites</b>	<b>108</b>	<b>29</b>	<b>31</b>	<b>49</b>
Volumetric – residential	235	141	141	104
Volumetric – commercial/industrial	50	38	38	33
Volumetric – other (park, etc)	19	16	16	15

Total volumetric property sites	304	195	195	152
Property sites - Total	412	224	226	201

Note: Property numbers exclude existing roads, busways and railway properties (other than freehold owned by QR within Brisbane Transit Centre)

## 6.2 Mayne Area

The key changes in the Mayne Area include the at grade CRR rail realignment, a new Breakfast Creek bridge, possible demolition and replacement of the suburban line bridge (if required), upgraded Mayne Yard east stabling and new stabling and supporting facilities in Mayne Yard North, and Mainline enhancements which also include construction of new overpass bridges for Mayne Yard East and Mayne Yard North access roads.

These changes will increase the construction area and duration of construction activities as well as increase the train frequencies and travelling speed when CRR is operational.

Mayne Yard is in a largely industrial/commercial area and the environmental values within the Mayne Area are consistent with those identified in the 2011 EIS and Evaluated Project. However, there has been recent mixed-use development in the area. The closest sensitive receptors are commercial properties on Burrow Street and residential properties and community spaces approximately 200m to the west, in Windsor.

Table 6.3 presents a summary of the likely changes in the environmental effects from the Proposed Changes to construction and operation of CRR Project compared to the Evaluated Project.

**Table 6.3. Effects of changes in the Mayne Area**

Aspect	Changed Environmental Effect - Construction	Changed Environmental Effect - Operations
Transport	Consistent – refer below	Consistent – refer below
Property	Consistent – refer below	Consistent – refer below
Soils, Geology and Geomorphology	Increase – refer below	Consistent – refer below
Landscape and Visual Amenity	Increase – refer below	Consistent – refer below
Nature Conservation	Increase – refer below	Increase – refer below
Hydrology	Increase – refer below	Increase – refer below
Air Quality	Decrease – refer below	Increase – refer below
Noise and Vibration	Increase – refer below	Increase – refer below
Cultural Heritage	Increase – refer below	No changed effect
Social	Consistent – refer below	Consistent – refer below

### TRANSPORT

At Mayne Yard, the project no longer includes excavation of the viaduct, however haulage at the site will still be required to import clean fill, ballast, sleepers, precast units and export spoil (unsuitable or contaminated material which cannot be reused onsite). During peak spoil movement there is anticipated to be 83 loads per day and during peak delivery movement 40 loads per day. Taking into consideration these volume and the numerous site entrances and route options, it is not anticipated that there will be significant impacts to the road network.



Additional construction access points to the north of Breakfast Creek and access via MacDonald Road identified in the Evaluated Project as optional are now required by the project to facilitate access to the northern area of the worksite and Breakfast Creek. Heavy vehicle access from Grafton Street via MacDonald Road has potential to conflict with the proposed North Brisbane Bikeway project (Stage 2 and 3).

The operation of the yard would not impact the external road network. Minor changes to internal operation of the yard arising from modifications to provide better accessibility and improved parking capacity. Overall the works have increased; however, the traffic and transport impact changes are still generally consistent with the Evaluated Project.

## **PROPERTY**

The Evaluated Project proposed temporary property impacts within the rail corridor up to the Albion Overpass just south of Albion Station, but did not have any works within Breakfast Creek. Adjacent land uses around Mayne Yard and Breakfast Creek are industrial, with some commercial and residential properties north of Breakfast Creek and are consistent with the land uses at the time of the RfPC-1 assessment.

Property impacts largely remain within the QR's Mayne Yard area, however have extended to also encompass the QR's rail maintenance centre. New impacts occur within Breakfast Creek to the north of Mayne Yard, which is unallocated State land, from the demolition and construction of a new rail bridge. The temporary property impacts within the existing rail corridor will be extended from the Albion Road underpass to Albion Station. Adjacent land uses include both commercial and residential, with a recently constructed large mixed-use development located at the intersection of Albion Road and Hudson Road known as 'Hudson at Albion Mill'. Potential impacts to adjacent properties during construction may include noise, dust and light.

## **SOIL, GEOLOGY AND GEOMORPHOLOGY**

The Evaluated Project identified that Mayne Yard is listed on the EMR and that areas of potential acid sulfate soils would be disturbed. Additional contaminated land investigation undertaken by the Delivery Authority within Mayne Yard identified soils having reported elevated concentrations of iron and aluminium. A review of the Environmental Management Register (EMR) against the Proposed Changes identified six additional properties adjacent to Mayne Yard, Breakfast Creek bridge and the work area extending north to Albion Station.

Approximately 76,900m<sup>3</sup> of material will be excavated during surface earthworks, particularly for stabling compared to 36,000m<sup>3</sup> required in the Evaluated Project. Therefore, there is an increased risk of disturbing potentially contaminated material with the Proposed Changes. Increased surface works associated within Mayne Yard and the construction within Breakfast Creek will increase the quantity of potential acid sulfate soil disturbance compared to the Evaluated Project. An acid sulfate soils investigation will be undertaken in accordance with the Queensland acid sulfate Soil Technical manual (QASSIT) guidelines and areas of potential and known acid sulfate soils will be identified on site environmental plans and managed in line with the Acid Sulfate Soils Management Sub-Plan. Key management measures are outlined within Volume 3 - Technical Reports.

## **LANDSCAPE AND VISUAL AMENITY**

Mayne Yard is predominantly industrial with commercial buildings to the east in Bowen Hills blocking prominent views into the rail yard. The residential allotments to the western side of Breakfast Creek are visually protected by the riparian vegetation along Breakfast Creek (which will be retained) and are set back behind the industrial lots. The most open view into the rail yard is from the Inner-City Bypass off-ramp down to Abbotsford Road.

Project Changes are predominantly to the northern yard with increased surface works and infrastructure installation which increase both the construction and operational visual impacts in the northern area of Mayne Yard. When reviewing Mayne Yard as a whole, the visual impacts would be generally consistent with the Evaluated Project as proposed with rail at ground level and elevated road over rail in the centre of the yard having less visual impact. The visual impact change from the surrounding viewpoints is generally low to moderate visual magnitude of change.

## **NATURE CONSERVATION**

These brownfield habitats hold limited ecological value, due to the general lack of structural diversity and important habitat characteristics (hollow-bearing trees, accumulations of leaf litter, woodland debris, canopy tree maturity and understorey complexity). The absence of these critical habitat features limits the availability of niche habitats that are necessary for supporting native fauna species. In particular, locally occurring threatened species.

Flora and fauna surveys completed in the Mayne Area found the proposed construction footprint is predominantly cleared with generally low ecological value, with the exception of marine plant communities present on the banks of Breakfast Creek. There are two areas of mapped Regional Ecosystems (REs), however, field validation found only the 'Least Concern' RE (12.1.3) occurring, being estuarine mangrove shrubland to low closed forest.

While the alignment will miss these mapped regional ecosystems, the narrow strips of unmapped remanent vegetation occurring right along the banks of Breakfast Creek are consistent with RE 12.1.3 and contain estuarine mangroves and other marine plant species, such as marine couch and sedges. As such, the proposed new Breakfast Creek bridge and demolition of the existing suburban line bridge will require the clearing of marine plants at Breakfast Creek, resulting in new direct temporary and permanent impacts. The permanent marine plant impacts include the direct project footprint as well as the requirement for ongoing maintenance of vegetation-free buffers to the new bridge structure in accordance with QR operational and safety standards.

The riparian vegetation along Breakfast Creek and is mapped as a flying-fox roost site by the Department of Environment and Science and there has been historical evidence it has supported Black Flying Fox (*Pteropus Alecto*). Four fauna surveys undertaken between 2014 to 2018, show the roost site use by the Black flying-fox is sporadic and declining. The Grey-headed Flying-fox (listed as vulnerable under the EPBC Act) was observed roosting at the southern end and the potential for seasonal use by the Little Red Flying-fox (*Pteropus scapulatus*) was recognised. There is potential for the above flying fox species to be present during the construction phase of the development, a fauna spotter-catcher working under a Rehabilitation Permit will be present during all preconstruction and construction works where fauna habitat will be disturbed or removed.

Overall the Proposed Changes cause new ecological effects, however, these would not have significant impact upon local or regional fauna and flora values and a further detailed assessment of these values and environmental effects are presented in Volume 3: Technical Reports.

## **HYDROLOGY**

The delivery of the new rail bridge and possible demolition of the existing bridge over Breakfast Creek requires construction works and the use of temporary structures within the watercourse. Flood modelling using an indicative construction methodology, predicted increases in flood levels in the order of 5 mm to 100mm upstream of the temporary crossing in floods ranging from 1 in 5 to 1 in 100 Annual Exceedance Probability (AEP) at Breakfast Creek. The small area at risk is under and north of the Inner City Bypass bridge over Breakfast Creek and Argyle Street, this area currently contains open space and road infrastructure, and is frequently inundated during king tides.

Detailed flood assessment will be undertaken during the detailed design in order to quantify potential flood impacts arising from the proposed construction methodology and identify suitable mitigation. Design requirements, construction staging, and other mitigation measures would be developed in consultation with stakeholders and approval agencies to comply with the Project Imposed Conditions including implementation to avoid afflux during construction and operation of the new bridge. The Breakfast Creek floodplain is heavily constrained with several existing structures crossing the waterway. Any modification to these structures has the potential to cause flood impacts upstream or downstream. The location, skew, soffit level and orientation of the bridge are proposed to be optimised to achieve acceptable flood mitigation.

No other works at Mayne Yard are proposed within the 1 in 100 AEP flood extents of the Brisbane River and Breakfast Creek. All facilities located within Mayne Yard would have 1 in 100 AEP flood immunity.

Potential impacts on surface waters from the construction include changes to surface water flow, sedimentation in surface water run-off, introduction of litter or toxicants from spills and disturbance of potential acid sulfate soils and contaminated land. With the increased volume of potentially contaminated spoil (76,900m<sup>3</sup> compared to 36,000m<sup>3</sup> in Evaluated Project) requiring removal the risk of mobilising contaminants in surface water runoff will increase. Construction activities within Mayne Yard area will be planned and implemented to avoid the redirection of uncontrolled surface water flows outside of worksites. This is consistent with the performance criteria stipulated in the Project Outline Environmental Management Plan (OEMP).

During operations a new drainage system for the east of Mayne Yard East and Mayne Yard North will be in place to capture runoff from stabling, access roads and carparks for treatment then discharge to Breakfast Creek. Bioretention and other water sensitive urban design considerations will also form part of the design where appropriate for the site conditions.

## **AIR QUALITY**

Air quality modelling for Mayne Yard for the Evaluated Project is predicted to exceed the nuisance-based criteria (as per the CRR Project Imposed Conditions) for 24-hour average TSP concentrations and annual average dust deposition at two commercial receptors near Mayne Yard. Air quality modelling included control measures such as water spray to control dust, and use of hoarding around the site. Considering the conservative approach to modelling adopted for this study, any exceedances at the commercial receptors are unlikely during the construction phase. The air quality impacts are generally consistent with the Evaluated Project which found similar exceedances at nearby commercial receptors.

The closest residential properties from the proposed Breakfast Creek bridge are approximately 100m away from the nominated construction. As the bridge will be installed in prefabricated segments minimising dust generation during construction, the contribution to air quality impacts from the bridge construction is considered low.

## **NOISE AND VIBRATION**

Construction noise impacts from surface rail works within Mayne Yard will be generally as per the Evaluated Project. Demolition works without any noise mitigation measures within Mayne East and Mayne North are predicted to result in exceedances of the construction noise goals within the Project's Imposed Conditions. During the day it is predicted that exceedances of up to 5 dB(A) for intermittent noise would occur at the nearest residential receivers on the western side of Breakfast Creek. The construction of the Breakfast Creek Bridge would also result in exceedances of up to 10 dB(A) for intermittent piling noise during the day at residential receivers on Grafton Street.

The likely construction and demolition methodology is not sufficiently developed to allow a prediction of the potential reduction in noise levels from mitigation measures. As an indicative range, a reduction of 5-10 dB from mitigation measures would typically be feasible.



Once operational, the realigned tracks in Mayne Yard would be approximately 120 m closer toward residential receivers on the opposite side of Breakfast Creek compared to the Evaluated Project. This, and the increased rail movement in Mayne North, result in an increase in the total rail noise levels at the nearest residential receivers compared to the Evaluated Project, however the airborne noise levels are still below the Project's operational noise criteria. The alignment change in Mayne Yard will decrease airborne noise levels to the east of the rail corridor compared to the Evaluated Project however the land usage in this area is predominantly industrial and does not include sensitive receivers.

## CULTURAL HERITAGE

No State heritage places are affected by the proposed changes. There are two additional heritage places identified, the QR listed Breakfast Creek Rail Bridge (Warren Truss Bridge) within the project footprint and the BCC listed Windsor Park to the west of the rail alignment between Breakfast Creek and the Albion overpass.

The Breakfast Creek rail bridge is located in the rail reserve at Albion. It is a steel and cast iron bridge consisting of riveted 6-panel half-through Warren trusses with riveted fish belly cross beams and rolled steel joist longitudinal. It has concrete abutments and double cast iron cylinder piers. The total length is 63.9m across Breakfast Creek. The bridge dates from 1902 when it replaced a former lattice girder bridge. The cast iron piers are from the original bridge. This bridge will be demolished completely, and heritage mitigation measures developed in consultation with QR. Windsor Park includes the Bowls Club, Croquet Club & former Aerodrome located at 69 Blackmore Street, Windsor. The dust deposition contour plots show construction impacts are not predicted to affect this heritage listed place.

## SOCIAL

As the works are contained within an existing rail environment this minimises the potential for other social impacts arising during construction and would not significantly affect access or connectivity. Visual impacts at Mayne Yard would be generally consistent with the Evaluated Project. It is anticipated that there may be an increased visual impact as a result of the new bridge, although this will be minor due to the surrounding land uses and existing bridge crossing (refer to visual and lighting technical report).

## 6.3 Northern Area

### 6.3.1 Exhibition Station

The Proposed Changes are to upgrade the existing Exhibition Station instead of providing a new station and the worksite relocation within the RNA showgrounds. In addition, the scope of a number of civil works within the rail were defined. Table 6.4 presents a summary of the likely changes to the environmental effects during construction and operation from the Proposed Changes compared to the Evaluated Project.

**Table 6.4. Effects of changes in the Exhibition Station**

Aspect	Changed Environmental Effect - Construction	Changed Environmental Effect - Operations
Transport	Decrease - refer below	Beneficial effect
Property	Consistent - refer below	Consistent - refer below
Soils, Geology and Geomorphology	No changed effect	No changed effect
Landscape and Visual Amenity	Decrease - refer below	Decrease - refer below
Nature Conservation	No changed effect	No changed effect
Hydrology	No changed effect	No changed effect
Air Quality	No changed effect	No changed effect

Noise and Vibration	Decrease - refer below	No changed effect
Cultural Heritage	Consistent - refer below	Consistent - refer below
Social	Consistent - refer below	Beneficial effect

## TRANSPORT

The proposed upgrade will lessen construction time compared to the Evaluated Project, which will reduce the impact on surrounding streets. There are multiple accesses proposed for construction of Exhibition Station, and these will change through different construction phases. The use of multiple entrances will assist with distributing construction traffic to minimise impacts on the road network. It is expected that RNA access will be primarily via O'Connell Terrace, from multiple gates within the RNA Showgrounds with additional access to the RNA will be required through Gregory Terrace. It is expected that the impact to the road network from this additional access will be minimal and will be manageable with traffic control, including signalisation of the intersection.

Operationally, the proposed design offers improved access to pedestrians compared to the Evaluated Project. The underpass and island platform will facilitate event patronage to disperse. Car parking and cycle access outcomes are consistent with the Evaluated Project.

## PROPERTY

North of Exhibition Station to Mayne Yard land use impacts remain largely as per the Evaluated Project. Additional access routes through the RNA Showgrounds to the Exhibition Station will be required at various construction stages. These will be developed in consultation with the RNA during construction to minimise impacts to showground operations.

The proposed temporary construction area adjoining the rail corridor has been relocated from the area known as 'Sideshow Alley' to part of the site fronting O'Connell Terrace. The relocation of temporary workspaces out of the centre of the site to the perimeter was on the request of RNA showgrounds and will result in a decrease in overall disturbance.

## LANDSCAPE AND VISUAL AMENITY

The visual impacts during construction would decrease compared to Evaluated Project due to the reduced road works at O'Connell Terrace. The Evaluated Project layout impacted adjacent fig trees. These trees will still be impacted to the same extent with the Proposed Changes resulting in a consistent level of visual impact.

During operation, the proposed upgrade to Exhibition Station, including the enhanced connection to Bowen Bridge Road included in the Proposed Changes will improve the visual amenity of the area.

## NOISE AND VIBRATION

The impacts for the proposed upgrade of Exhibition Station would be reduced compared to the noise impacts from a full redevelopment of the station assessed as part of the Evaluated Project. No significant additional noise impacts would be anticipated.

Operational noise from Exhibition Station will be as per the Evaluated Project.

## CULTURAL HERITAGE

The RNA showgrounds State heritage listing (#601709) applies to the entire RNA site and lists individual buildings. The Delivery Authority commissioned a Heritage Assessment of the RNA Showgrounds to understand the heritage significance of the site taking into consideration recent changes to the fabric of the place from redevelopment. This updated understanding of the site would allow for a more informed assessment of potential impacts to current values from the Evaluation Project Design. Recommendations from this assessment informed the further detailed design in the Proposed Changes.

There are no impacts anticipated to the Dairy Cattle Pavilion, Dairy Goat Pavilion, Beef Cattle Pavilion (works adjacent but no direct impact) and Affleck House. Other impacts which will remain the same as the Evaluated Project include:

- John MacDonald Stand - Brick arcade beneath the stands and the undocumented c1920s toilet block at the rear of the arcade are within or immediately adjacent to proposed extensions to rail platforms and pedestrian bridges. Possible construction impacts.
- Side Show Alley – timber boundary fencing along the boundary with the railway corridor. Likely to need replacement based on expanded rail corridor and current poor condition.
- Show Ring No.2 – possible removal of two mature fig trees along the southern perimeter of the show ring. Impacts due to creation of a new parallel and elevated rail line along the section of the rail corridor.
- Toilet Block (Interwar) – the proposed new elevated rail line and proximity of this structure to the existing rail corridor boundary. Impacts due to creation of a new parallel and elevated rail line along the section of the rail corridor.
- Exhibition Station – impacts to the existing corridor and station platforms, including a small timber ticket office on the northern platform. Likely requires removal due to platform upgrades and expansion.

Impacts to the various RNA showground heritage places from the Exhibition Station upgrade works will be consistent with the Evaluated Project. Three additional heritage properties were identified in the surrounding area of the Exhibition Station construction footprint. The Tufton House and the Old Museum building, both State and local heritage listed, are immediately adjacent to the project footprint, but not directly impacted. However, any vibration-intensive works occurring within 10 m of a heritage building (including RNA and the Old Museum) should be accompanied by pre-construction condition surveys and monitoring during construction.

## **SOCIAL**

During construction, there is an increased social benefit from the Proposed Changes compared to the Evaluated Project. The proposed construction staging ensures the availability of the station to patrons during annual Ekka events. This allows events at the showgrounds to be continued to be accessed by rail transport thus improving social inclusion of event attendees by continuing to provide affordable public transport options. Consistent with the Evaluated Project, the changes proposed at Exhibition Station will result in a number of improvements to the operational social impacts in this area including improved accessibility, connectivity and visual appearance. Further, the proposal has also reflected recent development in the area and addresses connectivity to key sites.

### **6.3.2 Northern Portal and Civil Structures**

Proposed Changes include a realigned construction access route through Victoria Park and demolition of a Department of Health building (Biomedical Technology Services), as well as slight surface track realignments near the Northern Portal. Table 6.5 presents a summary of the likely changes to the environmental effects during construction and operation from the Proposed Changes compared to the Evaluated Project.



**Table 6.5. Effects of changes in the Northern Portal Area**

Aspect	Changed Environmental Effect - Construction	Changed Environmental Effect - Operations
Transport	Increase – refer below	No changed effect
Property	Increase – refer below	Increase – refer below
Soils, Geology and Geomorphology	No changed effect	No changed effect
Landscape and Visual Amenity	Increase – refer below	No changed effect
Nature Conservation	Increase – refer below	No changed effect
Hydrology	No changed effect	No changed effect
Air Quality	Increase – refer below	No changed effect
Noise and Vibration	No changed effect	Increase – refer below
Cultural Heritage	Increase – refer below	Increase – refer below
Social	Increase – refer below	No changed effect

## TRANSPORT

Worksite access via the western side of Bowen Bridge Road (via Energex) is now proposed as a secondary access, with the primary access off Gregory Terrace. This will mitigate impact to public bus services and the Inner City Bypass ramp access from Bowen Bridge Road compared to the Evaluated Project. However, the impact of the proposed construction works on the road will be mitigated with the implementation of traffic management control.

The proposed design will offer a similar level of service; therefore, no operational impacts are anticipated.

## PROPERTY

An additional area at the eastern end of Victoria Park will be required for widening and extension of access from Gregory Terrace and the establishment of additional construction workspaces on the southern side of the rail corridor. A limited number of medium to low retention value trees will be required to be cleared within Victoria Park to facilitate the additional road. To ensure impacts on Victoria Park are minimised, it has been proposed to utilise the current Biomedical Technology Services site for site access and temporary potential construction and laydown purposes. Potential impacts to adjacent land uses which are commercial in nature may include noise, dust and light during night works. Land use impacts within Victoria Park are considered to be less than the Evaluated Project due to the new proposed access option which would still require the removal of existing trees within the BCC depot building area.

The temporary worksite area to the north of the existing rail corridor on Gilchrist Avenue remains as per Evaluated Project. Potential impacts to adjacent land uses which are commercial in nature may include noise, dust and light during night works.

## LANDSCAPE AND VISUAL AMENITY

This area is experienced daily by pedestrians travelling along the footpath which connects Victoria Park to Roma Parkland and through to the city. There are passive views of the rail corridor with some existing vegetation screening the transport corridor to the north. Due to this, along with the regularity of receptors using the thoroughfares, this view is considered to be of moderate visual sensitivity.

Visual impacts would arise from the minor tree removal and demolition of the Department of Health Building. This building is much larger than the previously impacted BCC depot building, and is listed as local heritage. This property would also serve as a laydown area during construction. Therefore, this access is assessed as having an increased visual impact compared to the Evaluated Project.

## NATURE CONSERVATION

A fauna and habitat assessment identified breeding places for Noisy Miner (*Manorina melanocephala*), Rainbow Lorikeet (*Trichoglossus haematodus*), microbat boxes and an inactive nest mound of Australian Brush-Turkey (*Alectura lathamii*). Other, potential refuge sites that may be used by reptiles for nesting or laying eggs include a hollow bearing log in Victoria Park and nest boxes. A Preliminary tree assessment and vegetation and flora assessment was completed to identify the vegetation types and value within the Northern Area.

The changed construction access route through to the Biomedical Technology Services does not impact on fauna habitat or breeding places identified in the fauna and habitat assessment. The Proposed Changes avoids impact on high value trees within BCC depot and the mapped area of general ecological significance under the BCC Plan identified as a grove of *Eucalyptus camaldulensis*, impacted by the Evaluation Project. This access route minimises impact to vegetation, to two low value trees impacted and other minor vegetation, it also minimises extent of impact to Victoria Park.

The removal of individual tree specimens and site works has the potential to impact on common fauna species, however impacts can be managed. A fauna spotter-catcher working under a Rehabilitation Permit will be present during all preconstruction and construction works where fauna habitat will be disturbed or removed.

## NOISE AND VIBRATION

There is no significant change to the Northern Portal design compared to the Evaluated Project. The construction noise and vibration impact from Northern Portal construction would be as per the Evaluated Project.

An increase in operational noise impacts is predicted to Brisbane Girls Grammar School due to the repurposing of existing rail tracks within Normanby Yard which sees the Up-Exhibition line decrease the distance between this receiver and the rail noise source. Noise impacts are dominated by freight movements on the realigned Exhibition line rather than noise from the CRR tracks. The school sports centre will experience an increase in noise levels of up to 6 dB as a result of the Proposed Changes. However, the only building predicted to experience an exceedance of the Project's operational noise criteria is the northern façade of the Sports Centre. A sports building would not be considered to be a noise-sensitive usage and any classrooms within the Sports Centre appear to be not located on the northern façade (or if they are, they do not have external windows). As such, no noise mitigation is considered necessary at this location.

## AIR QUALITY

The changed construction access would require the demolition of an existing building which is approximately 10,000m<sup>3</sup> and is adjacent to the existing rail corridor. The closest properties to this building are commercial premises, with the closest residential receptor approximately 100m to the south. Changing the location of the haul routes has the potential to affect local air quality from vehicle emissions, and dust generation from the need to demolish a building. Impacts would be temporary and dust generation will be managed through the implementation of best practice air quality management measures on site.

## CULTURAL HERITAGE

The Proposed Changes to the construction access will directly impact the local heritage listed site, New Zealand Loan and Mercantile Agency Company Woolstore (former), which is partially within the project footprint, and encompasses the Biomedical Technology Services building. The demolition of this building is an additional impact to heritage values not previously assessed. Detailed heritage assessment and archival recording will be required prior to demolition of these buildings.

The QR storage shed, a QR heritage listed site, will be demolished for construction of Feeder Station, consistent with the Evaluated Project impact. There will also be a slight increase in impacts to the State listed Victoria Park heritage values with the changed construction access and increased traffic volumes predicted. These impacts will be temporary during the construction period. Any works completed for the CRR Project will be undertaken following the process in the *Queensland Heritage Act 1992*.

There are also Aboriginal cultural heritage values in this area which will be managed in accordance with the CHMP.

## SOCIAL

The revised route would still access from Gregory Terrace, entering the rail corridor north of the BCC depot through the Department of Health (Biomedical Technology Services) property. This option has a smaller footprint through Victoria Park than the authorised route, resulting in slightly decreased impacts on the social and recreational values of the park although minor tree removal may still be required. This option would require the acquisition and demolition of the Department of Health facility. However, the relocation of this facility is not anticipated to have a significant social impact. The access may increase the amenity impacts to residential receptors south of Gregory Terrace.

## 6.4 Central Area

### 6.4.1 Alignment

There are minor alignment changes which straighten the tunnel and slightly extend the tunnel length towards the south. Table 6.6 presents a summary of the likely changes to the environmental effects during construction and operation from the Proposed Changes compared to the Evaluated Project.

**Table 6.6. Effects of changes in the tunnel alignment**

Aspect	Changed Environmental Effect - Construction	Changed Environmental Effect - Operations
Transport	Consistent - refer below	Beneficial effect
Property	Decrease - refer below	Decrease - refer below
Soils, Geology and Geomorphology	Decrease – refer below	Decrease – refer below
Landscape and Visual Amenity	No changed effect	No changed effect
Nature Conservation	No changed effect	No changed effect
Hydrology	No changed effect	No changed effect
Air Quality	No changed effect	No changed effect
Noise and Vibration	Decrease – refer below	No changed effect
Cultural Heritage	Decrease – refer below	No changed effect
Social	No changed effect	No changed effect

## PROPERTY

There is a change in volumetric and surface temporary and permanent acquisition requirements due to the change in alignment of the tunnels. The change to the total numbers of properties impacted is discussed in Section 6.1, specifically due to the straightening of the tunnel there has been a reduction of 43 volumetric acquisitions required under the Proposed Changes.

The Evaluated Project had volumetric impacts on the Brisbane Supreme and District Courts Complex and mixed commercial and residential sites along George Street between Herschel Street and Makerston Street. The Proposed Changes to the tunnel alignment from Albert Street to Roma Street has been realigned to a more direct route passing under King George Square and Emma Miller Place,



avoiding Brisbane City Hall and the Brisbane Supreme and District Courts Complex. Emma Miller Place will also be impacted volumetrically as a result of the new alignment.

There is a reduction of permanent volumetric impacts on commercial properties in Mary Street to the east of the Albert Street intersection. However, there will be additional temporary volumetric impacts on properties located in Mary Street to the west of the Albert Street intersection and in Albert Street for rock anchoring during construction.

Due to the realignment of Woolloongabba Station to the west of the Go-Print site, the underground tunnel to the north has also moved to the west. The result of this shift is that the St Nicholas Russian Orthodox Church is no longer impacted, however alternative land slightly west on Vulture Street is now impacted.

The change in location of the underground tunnel continues under the predominantly single unit and low-rise multi-unit residential area between Leopard Street and Main Street. The tunnel then straightens under the Brisbane River, resulting in a corresponding shift in the alignment slightly to the east under the Botanical Gardens. The tunnel alignment then recalibrates with the Evaluated Project alignment in Albert Street.

### **SOIL, GEOLOGY AND GEOMORPHOLOGY**

There are no changes to impacts from acid sulfate soils or contaminated land from the Proposed Changes to the tunnel alignment or slight shift in the Southern Portal location. Preliminary settlement analysis indicates settlement to be less than 10 mm above mined tunnels and up to 30 mm above the station caverns. This is less than the 0 to 50 mm of settlement estimated in the Evaluated Project due to improved tunnel boring machine technology. However, there has been a settlement of up to 60mm identified above the Boggo Road station box.

Specifically, there are 20 buildings categorised as having a 'slight risk' of damage induced damage as defined in the paper by Mair et al 1996<sup>1</sup> although one of these, Hotel Jen, will be demolished as part of the Project. Eleven buildings with 'slight risk' are high-rise, of which nine are located near Albert Street Station, one near Roma Street Station and one located near Boggo Rd Station. The settlement analysis has concluded that the potential for settlement and building damage in these locations for the proposed alignment is 'slight' and 'very slight', respectively.

### **NOISE AND VIBRATION**

Operational noise and vibration impact within the Central/Tunnel Area are predicted to comply with the Coordinator General's imposed noise and vibration criteria at all receivers via selection of appropriate low-vibration trackforms. The change to alignment between Boggo Road Station and Woolloongabba Station, reduces vibration levels from curving that would result in increased groundborne noise levels for residential receivers above the tunnels. As a result, impacts would be reduced compared to the Evaluated Project in this section.

For tunnelling between Roma Street Station and Albert Street, exceedance of the human comfort vibration criterion for office buildings is predicted for 123 Albert Street, Brisbane. No exceedances of the groundborne noise or human comfort vibration criteria are predicted for tunnelling works between Albert Street Station and Woolloongabba Station. Between Woolloongabba and Boggo Road groundborne noise and vibration levels are predicted to exceed criteria for residential receivers located to the south/west of the Pacific Motorway in Woolloongabba within approximately 30 m of the tunnel alignment. No groundborne noise impacts to the Ecosciences Precinct, TRI Building or PA Hospital are predicted.

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<sup>1</sup> Mair RJ, Taylor RN and Burland JB., 1996, Prediction of ground movements and assessment of risk of building damage due to bored tunnelling.

## CULTURAL HERITAGE

This preliminary surface settlement impact assessment of the project alignment within the zone of influence identified only two heritage listed buildings or structures with a slight risk of settlement-induced damage as defined in the paper by Mair et al 1996<sup>2</sup>. This is significantly less than the number identified within the previous 2011 EIS and the Evaluated Project.

Other indirect impacts are from traffic and dust generation from construction activities in the central area, however, compared to the Evaluated Project the mined cavern construction method will reduce these impacts from the current box cut excavation station methodology proposed.

The estimated ground-borne vibration from tunnel boring machine excavation is under 0.5 mm/s along the mined tunnel sections, well below the established heritage threshold of 2 mm/s.

### 6.4.2 Roma Street Station

The Proposed Changes at Roma Street are the relocation of the underground station to under the surface railway, a redesigned plaza entrance to provide intermodal transport hub, lowering of the Roma Street end of the INB underground and changes to construction worksites. Table 6.7 presents a summary of the likely changes to the environmental effects during construction and operation from the Proposed Changes compared to the Evaluated Project.

**Table 6.7. Effects of changes in the Roma Street precinct**

Aspect	Changed Environmental Effect - Construction	Changed Environmental Effect - Operations
Transport	Increase – refer below	Beneficial effect
Property	Increase – refer below	Beneficial effect
Soils, Geology and Geomorphology	Increase – refer below	No changed effect
Landscape and Visual Amenity	Increase – refer below	Beneficial effect
Nature Conservation	No changed effect	No changed effect
Hydrology	No changed effect	Decrease – refer below
Air Quality	Increase – refer below	Beneficial effect
Noise and Vibration	Increase – refer below	No changed effect
Cultural Heritage	Increase – refer below	Beneficial effect
Social	Increase – refer below	Beneficial effect

## TRANSPORT

There will be a material increase in the volume of spoil to be hauled from Roma Street, with the incorporation of the INB underground into the station the spoil volume doubles to 245,000 bcm compared to 120,000 bcm in the Evaluated Project. This additional spoil increases peak trucks per hour to 15 compared to 6 predicted in the Evaluated Project. Spoil haulage and deliveries in this area are required to occur outside of peak hours (in accordance with the Project's Imposed Conditions) which minimise impact from heavy vehicles on the road network during these times.

Construction methodology of the underground station has been optimised to reduce impact on pedestrians and station users. However, lowering and relocation Roma Street end of the INB will increase the area of works in the Roma Street precinct and will impact the operation of the busway, requiring diversion of buses onto Roma Street. The duration of the diversion and the strategies to manage this impact will be developed during detailed planning and options assessment which is currently in progress through a working group which includes BCC and TransLink.

It is anticipated that the functionality and capacity of the relocated coach terminal, as assessed in RfPC 2, will not be affected by this project change. Minor delays to buses travelling through Roma Street (to and from Parkland Boulevard) are possible due to the Roma Street worksite. However, it is not expected that these delays will represent a major disruption to the overall operation of the coach terminal.

Roadworks will be required in Herschel Street, Makerston Street and Roma Street to improve footpaths and pedestrian mobility while construction works are underway. Changes to vehicles and pedestrian movements can be incorporated while maintaining an acceptable level of service.

The proposed design of the Roma Street precinct will provide customers with one combined transport interchange that will connect with the proposed INB, Brisbane Metro, long distance coach terminal and suburban and regional rail services. The underground station will be relocated to the east to free up frontage for an open plaza that will provide safer and shorter walking routes to the station. The new plaza will provide improved pedestrian.

### **PROPERTY**

Land use impacts will also be reduced on mixed residential commercial properties located on George Street between Herschel Street and Makerston Street, however there will be an increased interface with the Roma Street end of the Inner Northern Busway during construction. Additional construction areas to facilitate development of the Roma Street Station will be required on land adjoining the existing rail corridor, which is currently used for railway employee carparking, operations and maintenance.

Emma Miller Place will have a temporary surface impact as well as a permanent volumetric impact. This area will be returned to its original state following completion of the temporary surface construction works. Additional permanent volumetric will be developed at the far western end of the Brisbane Transit Centre, this area will be used as a plant and equipment room for station maintenance. Overall, the extent of volumetric impact for Roma Street Station has increased from the Evaluated Project, however those impacts are confined to State-owned land. Operationally the design will increase the area available for precinct development.

### **SOIL, GEOLOGY AND GEOMORPHOLOGY**

Three additional lots on the EMR within the railway yards are impacted by works, and two additional adjacent lots on the EMR. With the additional excavation required for the lowering of the Roma Street end of the INB into the underground station there is an increase in the potential to disturb and manage contaminated soils.

The area with the greatest difference of predicted settlement is around Roma St Station, with the Proposed Changes having a reduced impact upon the Brisbane Magistrates Court with the risk of the settlement goes from 'Slight' to 'Very Slight'. Further settlement modelling is required to determine any changes to settlement impacts from the incorporation of the Roma Street end of the INB into the underground station.

### **LANDSCAPE AND VISUAL AMENITY**

The potential visual impact during construction is considered to be moderate-high due to the length of time works will occur and the sensitivity of the surrounding receptors and city context. During construction, the visual impact associated with the lowering of the Roma Street end of the Inner Northern Busway is considered to be an incremental increase in visual impacts compared to the Evaluated Project. These impacts to Emma Miller Place resulting in vegetation loss are temporary and the park and landscaping will be reinstated following the temporary surface construction works.

The operational visual magnitude of change is expected to be moderately beneficial due to an enhancement of visual amenity to the area. Overall, the station design and improvement of public transport alignment is anticipated to improve the visual amenity of the viewpoints and views of the



station heritage values. Once Emma Miller Place has re-established the magnitude of landscape impact will be low with the reinstatement of the green space post-construction.

## **NATURE CONSERVATION**

Emma Miller Place is an important area of city green space. The landscape comprises terraced grass areas and established trees and palms that impart a sub-tropical character including large Figs (*Ficus benjamina*), Leopard trees (*Caesalpinia ferrea*), Jacarandas (*Jacaranda mimosifolium*), Tuckeroo (*Cupaniopsis anacardioides*), Tulip tree (*Liriodendron tulipifera*), Poinciana (*Delonix regia*) and Hoop Pine (*Araucaria cunninghamii*). The existing trees within Emma Miller Place would be removed, however, following construction, these areas would be reinstated with new landscaping and compensatory tree planting.

## **HYDROLOGY**

Roma Street Station is susceptible to Brisbane River flooding in the 1 in 10,000 AEP, with flood level approximately 3.7m above the entry level of the station. Deployable flood protection devices (demountable barriers) are now proposed in the design to protect against the regional 1 in 10,000 AEP flood plus sea level rise. This improves flood immunity compared to the Evaluated Project as the impacts of climate change are factored into the predicted flood levels. The Roma Street Station design floor level is set at 14.40m AHD, providing passive flood immunity up to 1 in 1,000 AEP. The station is located outside of the 1 in 100 AEP flood extents and will be built within an existing building footprint therefore unlikely to alter existing flow regimes.

Changes to the drainage regime as part of the Project are minor. At Roma Street Station precinct there is insufficient space to provide bio-retention basins therefore an underground treatment unit is proposed to reduce nutrient discharge.

## **AIR QUALITY**

The Evaluated Project's construction methodology for Roma Street Station included a large acoustic shed over the cut-and-cover shaft (located centrally in the worksite), supporting the mined cavern construction and station works. No exceedances of the air quality project goals as set out in the Coordinator-General's Imposed Conditions are predicted off-site.

Due to a proposed increase in the scale of works at Roma Street required for the Proposed Changes, dispersion modelling has been carried out which included expansion of the scale of works due to surface works associated with the relocation of the Roma Street end of the INB. No exceedances of the air quality goals are predicted off-site. Dust generation would occur through excavation and piling needed to deliver the vent shaft and the 'vertical transport box' however this would be managed by the contractor through proven dust management techniques.

Operationally, the lowering of the Roma Street end of the Inner Northern Busway underground will remove bus movements on surface roads surrounding Roma Street Station. This has the potential to improve air quality (marginally) by removing bus movements and subsequent emissions throughout the day and in particular reducing the contribution of buses to congestion at peak times.

## **NOISE AND VIBRATION**

The eastern egress shaft in Lot 60 is located further to the east than assessed for RfPC-1. Noise modelling identifies predicted exceedances of the project's construction noise goals at the Abbey Apartments at night of up to 5 dB for site establishment, and up to 5 dB for shaft excavation with a medium-performance enclosure. No exceedance is predicted for shaft excavation with a high-performance enclosure. There are predicted exceedances of the construction noise goals at the Supreme Court of up to 3 dB for site establishment, and up to 4 dB for shaft excavation with a medium-performance enclosure. No exceedance is predicted for shaft excavation with a high-performance enclosure. No exceedances are predicted at the Magistrates Court.

Airborne noise emissions from the excavation of the cut-and-cover shaft for the Inner Northern Busway are expected to be substantially the same as for the RfPC-1 assessment (which included cut and cover construction for the station works), with levels of up to 84 dB(A) predicted at Abbey Apartments. This would result in a 14 dB exceedance of the construction noise goals during the day, 19 dB during the evening and a 27 dB exceedance at night. External noise level of up to approximately 84 dB(A) is predicted at the façade of the Supreme Court. This is higher than the worst-case level at the Courts predicted for the RfPC-1 construction works and an exceedance of the noise goals by 19dB. Noise levels at the Magistrates Court would be 1-2 dB lower than at the Supreme Court due to the slightly increased separation distance between the closest point of approach of the works and the Magistrates Court.

Mitigation measures will be confirmed during detailed construction planning. In accordance with the Imposed Conditions, exceedances of greater than 20 dB over the noise criteria would trigger a requirement for consultation with the affected property and a requirement to conduct works only during the daytime with respite periods.

During operation the relocated Roma Street station will result in a change to the source location for mechanical ventilation noise sources. These noise sources will be designed to comply with project's operational noise criteria as part of the detailed design of the project.

## **CULTURAL HERITAGE**

The proposed Roma Street Station is now moved under the existing heritage listed station. The maximum surface settlement at Roma Street station is expected to be in the range of 0-50 mm, which is higher than 20-25 mm estimated for the Evaluated Project. The existing Roma Street Station building is identified as having a 'Slight Risk' of damage which will require settlement monitoring. Additional settlement modelling will also be required for the proposed Roma Street section of the INB relocation. The proposed construction methodology of the INB is an underground cut-and-cover tunnel which will run generally parallel with Roma Street, at the southern edge of the Brisbane Transit Centre site. Once additional settlement modelling has been completed, the final heritage impacts will be provided for comparison against the Evaluated Project.

Once operational the plaza entrance will open the visual line of sight through to the heritage listed Roma Street Station, increasing the views and amenity opportunities of the heritage value providing beneficial value.

## **SOCIAL**

The realignment of Roma Street Station and Rome Street end of the INB has the potential to increase adverse social impacts during construction compared to the Evaluated Project, due to the incremental increase in the scale of works and associated spoil loading and traffic. The works will result in temporary impacts to Emma Miller Place for the construction of the busway. This would have a temporary negative social impact due to loss of parkland and greenspace in this location. Once the surface construction works are completed within Emma Miller Place full landscaping and site rehabilitation works will be completed to ensure the site is reinstated to its previous condition. Construction methodology will also be optimised to reduce impact to pedestrians and station users.

Once operational, the new plaza will provide improved public space and pedestrian capacity and will connect well with the proposed pedestrian crossing at Roma Street. There will also be increased opportunity for street front development. The busway lowering will provide improved integration of transport options in this area including Brisbane Metro. Overall, the development of Roma Street Station will significantly improve the visual amenity and attractiveness of this area.

### 6.4.3 Albert Street Station

The Proposed Changes will move the station cavern north along Albert Street, with the main entrance on the corner of Albert Street and Mary Street and a second entrance at 142 Albert Street. The construction methodology changes from an open box cut to a fully mined cavern solution reducing surface construction works. **Table 6.8** presents a summary of the likely changes to the environmental effects during construction and operation from the Proposed Changes compared to the Evaluated Project.

**Table 6.8. Effects of changes of Albert Street Station**

Aspect	Changed Environmental Effect - Construction	Changed Environmental Effect - Operations
Transport	Decrease – refer below	No changed effect
Property	Increase – refer below	Beneficial effect
Soils, Geology and Geomorphology	Decrease - refer below	No changed effect
Landscape and Visual Amenity	Decrease – refer below	Beneficial effect
Nature Conservation	No changed effect	No changed effect
Hydrology	Decrease - refer below	No changed effect
Air Quality	Decrease – refer below	No changed effect
Noise and Vibration	Increase – refer below	No changed effect
Cultural Heritage	Decrease – refer below	No changed effect
Social	Decrease – refer below	Beneficial -refer below

#### TRANSPORT

Construction will require approximately 13 trucks per hour, compared to five which was estimated for the Evaluated Project. Traffic analysis has been conducted for this change and shows that the road network would continue to function with similar levels of service at key intersections. The change in construction methodology reduces impact and will be less disruptive to existing surface level retail and commercial activities, pedestrian and vehicular movements, and essential utility services than the Evaluated Project.

The updated design of Albert Street reduces the impact on the road infrastructure while providing a safer and more efficient movement of pedestrians. This also includes less impact on the intersection of Albert and Charlotte Street, and the Myer Car park ramp would be retained with no closure required during construction. Some additional roadworks will be required in Mary Street and Charlotte Street to facilitate changes to traffic signalling and improve pedestrian flow during construction.

The proposed design changes will require minor modification to the intersection analysis presented in the Evaluated Project. These modifications and consequent impact have been reviewed in the traffic analysis and found that modifications required as part of the proposed design include changes to signal personalities and geometric alignments, though the impact remains generally in accordance with the Evaluated Project. Further analysis will be completed when assessing the cumulative impact as a result of the several major projects in progress/planned in the CBD.

#### PROPERTY

Albert Street Station requires the demolition of the same ten small commercial properties located on the north-west corner of the Albert Street intersection with Mary Street and one medium rise commercial building on the south-west corner of this intersection. In addition, the development of a second pedestrian entrance located in Albert Street near its intersection with Elizabeth Street results in additional permanent volumetric land requirements, as well as a surface requirement from three



additional properties. The land impacted is zoned PC 1 Principal Centre (City Centre) and are privately-owned medium-rise commercial buildings.

Some properties which were not previously affected by the Evaluated Project but are adjacent to the second pedestrian entrance are now impacted by volumetric requirements. There are also slightly increased volumetric requirements under properties located in Albert Street between Elizabeth Street and Queen Street. There will also be additional volumetric impacts on properties located in Mary Street to the west of the Albert Street intersection and in Albert Street for rock anchoring during construction.

Operationally the Proposed Changes improves property impacts by facilitating full over station development on Lot 2 and facilitates the Albert Street Vision Project by removing the street entrances and having plaza entrances to the station.

### **SOIL, GEOLOGY AND GEOMORPHOLOGY**

The Evaluated Project had identified potential for disturbance of acid sulfate soils at Albert Street Station. The fully mined cavern construction methodology now proposed reduces the surface excavation area thus reducing the potential volume of acid sulfate soils that could be disturbed.

Predicted settlement from tunnelling identified twenty building with 'slight' to 'very slight risk' of building damage. Albert St (between south of Mary St and north to Charlotte St) and intersection between Albert St and Elizabeth St – estimated settlement between 20 to 30mm. This impact has reduced with the fully mined station cavern methodology proposed compared to the Evaluated Project, which predicted a 25 to 50mm settlement zone extending 30m from the shaft.

### **LANDSCAPE AND VISUAL AMENITY**

The construction of the Project will directly impact several low-medium height shopfronts and commercial buildings. The existing character will be altered; therefore, the landscape sensitivity is considered to be moderate-high. Major construction works were proposed under the Evaluated Project; however, the Proposed Changes significantly reduce surface construction works which would result in a decreased landscape character impact.

The Proposed Changes are similar to the Evaluated Project, however, the consolidated entrances and removal of structures from Albert Street contributes to the Albert Street Vision in this area. The visual impact outcomes are consistent with the Evaluated Project due to the beneficial and improved visual amenity proposed in each design.

### **HYDROLOGY**

The street levels at the junction with Elizabeth Street are higher than the previous location of the station entrance which was further south. This reduces flood risk and makes the design of the entrance simpler. The station design level is above the 1 in 100 AEP riverine flood levels and requires deployable flood protection against riverine flood for 1 in 10,000 AEP (plus sea level rise). Various flood protection options have been considered to provide flood protection up to the 1 in 10,000 AEP and the preferred solution will be determined during detailed design.

### **AIR QUALITY**

The additional demolition of 142 Albert Street and the construction of an additional northern pedestrian entry to the station will generate air quality impacts. The Royal Albert apartments are located opposite the worksite and are the closest residential receptor. Sensitive receptors are likely to include staff and customers of the various commercial premises and residential receptors nearby may also be affected depending on wind direction. Consistent with the Evaluated Project, quantitative modelling has not been conducted at Albert Street due to a low potential for adverse air quality impacts compared to other sites.

With the changed station construction methodology to fully mined cavern from a cut-and-cover there will be a significant reduction in surface works and excavation and thus reduced dust generation from the worksite. An acoustic shed is still proposed to be employed during construction.

## **NOISE AND VIBRATION**

The demolition works at 142 Albert Street are predicted to result in exceedances of the Project's construction noise goals of 15 dB (day) and 28 dB (night) for residential receivers, and exceedances of up to 27 dB for commercial receivers. This is an increase compared to the Evaluated Project and is due to the close proximity of the 142 Albert Street site to nearby receivers. Potential mitigation measures for demolition activities depend on the detailed planning of the activity as to which measures are feasible. As an indicative range, a reduction of 5 to 10 dB from mitigation measures would typically be feasible.

The construction noise impacts from the new northern cavern have been predicted for site establishment works and for shaft excavation (which would be in an acoustic shed). Site establishment works would result in exceedances of up to 5 dB (day) and 18 dB (night) at residential receivers, and exceedances of up to 17 dB for commercial receivers.

Shaft excavation works would result in exceedances of up to 3 dB (day) and 16 dB (night) at residential receivers and exceedances of up to 15 dB for commercial receivers for works conducted within a medium-performance acoustic shed. Works conducted within a high-performance acoustic shed would result in no exceedances during the day for residential receivers and exceedances of 4 dB at night for residential receivers, and exceedances of up to 3 dB for commercial receivers.

Groundborne vibration levels for excavation of the station cavern at the northern site are only predicted to exceed the commercial/ residential daytime vibration criterion for approximately 5% of construction works, and to exceed the residential night-time vibration criterion for 30% of construction works. Groundborne noise levels are predicted to exceed the night-time residential criteria for approximately 10% of the construction works. Groundborne noise levels from the station excavation at the southern (Mary Street) cavern would be as per the Evaluated Project.

Once operational, the relocated Albert Street station will result in a change to the source location for mechanical ventilation noise sources. These noise sources will be designed to comply with project's operational noise criteria as part of the detailed design of the project.

## **CULTURAL HERITAGE**

The Proposed Changes results in a reduced risk to heritage buildings from settlement and ground borne vibration with the reduced vertical alignment of the tunnel and the mined cavern method instead of a large cut-and-cover station structure. The predicted settlement of 0 to 50 mm from Albert Street Station works is consistent with the current Evaluated Project. Groundborne vibration levels from station excavation on the northern 142 Albert Street cavern are predicted to reach a maximum vibration level of 0.77 mm at nearby receivers.

## **SOCIAL**

Amenity impacts (noise, vibration, dust) would be expected to decrease with the fully mined construction method and reduced surface works. This will reduce disruption to existing retail and surrounding residents. Shifting Albert Street Station cavern north provides better connection to CBD destinations and allows the retention of the Myer ramp therefore minimising access disruption. The revised station design results in reduced structures on Albert Street, optimising pedestrian movement and contributing to the Albert Street Vision. The provision of consolidated station building entrances and a plaza would result in positive social impact relating to improved accessibility, pedestrian amenity and public space.

### **6.4.4 Woolloongabba Station**

The Proposed Changes include shifting the station building to the west, which increases the distance to 320m between the station and The Gabba, providing more space for event crowds. Table 6.9 presents a summary of the likely changes to the environmental effects during construction and operation from the Proposed Changes compared to the Evaluated Project.

**Table 6.9. Effects of changes in the Woolloongabba Station Area**

Aspect	Changed Environmental Effect - Construction	Changed Environmental Effect - Operations
Transport	Consistent	Beneficial effect
Property	No changed effect	Beneficial effect
Soils, Geology and Geomorphology	Decrease - refer below	No changed effect
Landscape and Visual Amenity	Consistent – refer below	Beneficial effect
Nature Conservation	No changed effect	No changed effect
Hydrology	No changed effect	No changed effect
Air Quality	Decrease - refer below	No changed effect
Noise and Vibration	Decrease - refer below	No changed effect
Cultural Heritage	No changed effect	No changed effect
Social	No changed effect	Beneficial effect

## TRANSPORT

The volume of spoil estimated to be hauled from Woolloongabba has increased from 470,000 bcm to 526,000 bcm. This results in an increase in peak haulage with a maximum of 23 trucks per hour anticipated, compared to 11 for the Evaluated Project. This increase is not expected to have significant additional traffic impacts.

There may be some minor interruptions during construction to the road network and the busway. These will be minimised where possible, for example by undertaking lane closures at night or outside of peak periods. The Proposed Change relocating the Woolloongabba Station one block to the west of the Evaluated Project, increases the walking distance to/from the Gabba, which assists in dissipation and regulation of crowd movements on event days. The design proposes to consolidate the station entrance points to one, thus improving pedestrian legibility.

Consistent with the Evaluated Project, the introduction of Woolloongabba Station results in a significant increase in pedestrian volumes in the precinct. However, when these volumes are dispersed around the site and broken down into volumes per cycle time, it is not anticipated that there will be significant adverse impacts on the path and pedestrian network.

## SOIL, GEOLOGY AND GEOMORPHOLOGY

Remediation of this site is underway with the intention to remove site from the EMR, thus, there will be reduced risk of disturbing contaminated soils during station cut-and-cover excavation compared to the Evaluated Project. The predicted settlement is consistent with the Evaluated Project levels, and only two buildings with 'very slight risk' of damage were identified. The estimated ground-borne vibration from tunnel boring machine excavation in this section is under 0.5 mm/s.

## LANDSCAPE AND VISUAL AMENITY

The Proposed Changes to construction works at Woolloongabba Station will result in an overall consistent visual impact compared to the 2011 EIS assessment as the station location is within a similar context. The Evaluated Project had the Woolloongabba Station positioned further to the east however the design intent and associated impacts of the Proposed Changes are similar in approach and consistent with the Evaluated Project. Overall the new station development and pedestrian connectivity are anticipated to be beneficial and improve visual amenity of the viewpoint.

## AIR QUALITY

Air dispersion modelling was completed for the Evaluated Project. The assumptions for the Evaluated Project related to spoil generation, vehicle and machinery movements included in the dispersion



modelling have been updated to reflect the Proposed Changes. The revised air dispersion modelling outputs of the distribution of impacts for particulate matter, TSP and dust deposition show that with acoustic enclosure, water sprays and hoarding controls exceedance of the nuisance-based TSP goals is predicted at a commercial property near the site and dust deposition goals are predicted for three properties immediately surrounding the worksite. No exceedances of other air quality goals are predicted off-site. This revised assessment predicts that impacts would be marginally less than previously approved as part of the Evaluated Project. Although the total volume of spoil from Woolloongabba would be increased from the Evaluated Project, there would be lower peak levels of spoil generation (and therefore fewer vehicle movements).

No exceedances of relevant short term (24-hour) or long term (annual average) criteria are predicted at any of the residential receptors surrounding the site for all pollutants with the exception of 24-hour average TSP concentration predicted at a commercial receptor on Main Street. Exceedances of dust deposition criterion are predicted at three receptors surrounding the site.

## **NOISE AND VIBRATION**

The change in station location will result in a change in noise exposure for surrounding properties compared to the Evaluated Project. The construction method would still include acoustic shed(s) which would assist in mitigation of noise and dust impacts at the site.

The proposed station location would generally result in lower construction noise levels at the worst-affected receivers compared to the Evaluated Project, noise levels at other receivers to the west (which are less-affected by the Evaluated Project) would increase. The highest predicted noise level at any receiver resulting from the Proposed Changes construction is lower than the highest predicted noise level at any receiver from the Evaluated Project. The busway bridge is predicted to result in no exceedances of the construction noise goals for the Project during the day and exceedances of up to 1 dB at night at surrounding residential receivers, and no exceedances at St Nicholas Russian Orthodox Cathedral.

Once operational, the relocated Woolloongabba Station will result in a change to the source location for mechanical ventilation noise sources. These noise sources will be designed to comply with environmental noise criteria as part of the detailed design of the Project.

## **SOCIAL**

The station location is proposed to move 70m west, further from sensitive receptors however amenity impacts arising from noise, vibration, dust and truck movements during construction would be generally consistent with the Evaluated Project. During operation, the realignment of the station would provide improved accessibility during events and intermodal connectivity with the bus station increasing accessibility to transport and travel options.

### **6.4.5 Boggo Road Station and Southern Portal**

The main change to Boggo Road Station is the extension of the north mined station cover by 25m and lowering of the station by approximately 2m compared to the Evaluated Project, although it remains within the property impact area. Upgrades include an elevated step-free bridge over the railway that will connect the Boggo Road Urban Village and the PA Hospital, instead of the subterranean walkway proposed in the Evaluated Project. The Proposed Changes to lower Boggo Road Station and the vertical alignment of the tunnel compared to the Evaluated Project minimises conflicts with the freight flyover. Table 6.10 presents a summary of the likely changes to the environmental effects during construction and operation from the Proposed Changes compared to the Evaluated Project.

**Table 6.10. Effects of changes in the Boggo Road and Southern Portal Area**

Aspect	Changed Environmental Effect - Construction	Changed Environmental Effect - Operations
Transport	Consistent – refer below	Consistent
Property	Increase - refer below	Increase - refer below
Soils, Geology and Geomorphology	No changed effect	No changed effect
Landscape and Visual Amenity	Increase – refer below	Consistent
Nature Conservation	No changed effect	No changed effect
Hydrology	No changed effect	No changed effect
Air Quality	Increase – refer below	No changed effect
Noise and Vibration	Decrease - refer below	Increase – refer below
Cultural Heritage	No changed effect	No changed effect
Social	Decrease – refer below	Beneficial effects

## TRANSPORT

At Boggo Road Station, the volume of spoil requiring haulage has increased to 210,000 bcm, which is an increase from 110,000 bcm assessed in the Evaluated Project. This increases heavy vehicle traffic, with the peak trucks per hour increased to 24 from six in the Evaluated Project (and nine in the 2011 EIS). The potential impact of this change on the road network will be managed by having a second entrance to the worksite via Boggo Road, which will distribute the flow of heavy vehicles via Peter Doherty Street and Boggo Road.

Boggo Road Station has been relocated although it remains within the Evaluated Project footprint. This modification allows for an updated design that replaces the pedestrian underpass with a bridge. This will offer a safer and more efficient connection to the Boggo Road Urban Village, the Hospital and surrounding Universities.

## PROPERTY

Under the Evaluated Project there were permanent surface impacts of Boggo Road Station confined to the Reserve land known as 'Outlook Park', with only temporary surface construction and volumetric impacts on adjacent land. The Proposed Changes result in an increase in permanent impact to the surface and subsurface of land zoned as Specialised Centre – major education and research of approximately 4132m<sup>2</sup> and land zoned as Mixed use (Corridor) of 481m<sup>2</sup>. Both impacted parcels are owned by The State of Queensland (represented by Department of Housing and Public Works). Due to the shift of the underground station box to the west, the Ecosciences Precinct will have an increased volumetric impact under the north-eastern corner of the site.

Additional land for temporary use as laydown during construction has been identified on Joe Baker Street, adjacent to the Eastern Busway Station. This may result in a heightened interface with users of the Eastern Busway Station, with potential impacts such as noise, dust and changes to access routes to the Busway Station during construction. It is considered that construction land use impacts at this location will be greater than the Evaluated Project due to the increased area proposed. On completion of construction works, land around Boggo Road Station will be available for future development.

## LANDSCAPE AND VISUAL AMENITY

The construction works are proposed in a mixed land use area, and there are multiple sensitive receptors of moderate sensitivity in the surrounding area.

The operational visual impacts are generally consistent compared with the Evaluated Project due to the surrounding receptors and extents of operational works proposed. The design will be positioned closer

to the rail corridor compared to the Evaluated Project which was between existing buildings. The operational visual impacts of the Proposed Changes are consistent with the Evaluated Project due to the station-built form however the pedestrian bridge which was underground is now an elevated span which would marginally increase the visual impact.

## **NOISE AND VIBRATION**

Construction noise impacts from Boggo Road Station would decrease compared to the Evaluated Project due to the reduced extent of cut-and-cover works. However, the new pedestrian/cyclist bridge construction works at Boggo Road are predicted to result in unmitigated exceedances of up to 6 dB during the day and of up to 14 dB at night at surrounding residential receivers; and exceedances of up to 3 dB (day) and 11 dB (night) at the ESA Leukaemia Village. Road works required for spoil haulage from this site are also predicted to result in unmitigated exceedance of the construction noise goals at nearest sensitive receivers. A reduction of 5-10 dB from mitigation measures would typically be feasible and will be determined as the construction methodology is further developed.

Maximum construction noise impacts from the Southern Portal construction works will be largely as per the Evaluated Project although the extent of construction will increase. Noise and vibration impacts to Ecosciences, ESA Leukaemia Village and PA Hospital will be as per or lower than the Evaluated Project. Noise impacts for the TRI building and residential receivers on Railway Terrace will increase due to the greater extent of cut-and-cover construction.

In operation, the Proposed Changes' Southern Portal locations will result in a minor increase in noise level at receivers to the east of the rail corridor due to the changed portal locations, which have shifted to the east. There is an increase in airborne noise levels at the PA Hospital, TRI Building and PACE Building however noise levels at these locations are below the Coordinator-General's Environmental Design Requirements in the Imposed Conditions.

## **SOCIAL**

The Proposed Changes and partial mined cavern approach reduces disruption to the PA Hospital, the Ecosciences Precinct, the surrounding bus network and the freight line compared to what was expected with the cut-and-cover method assessed in the Evaluated Project. Access for construction logistics utilises existing infrastructure (Eastern Busway) to reduce impact compared to the current Evaluated Project.

The design moves the station 25m north and would provide a pedestrian overpass rather than the previously evaluated underpass, providing improved connectivity. The updated design reduces the impact on existing rail and bus infrastructure.

## **6.5 Southern Area**

### **6.5.1 Dutton Park Station**

Dutton Park Station upgrade is part of the Evaluated Project however the Proposed Changes increase the extent of works, including moving the station location to the south, provision of a covered pedestrian overpass, demolition of an existing ramp and station building and construction of retaining walls. A temporary platform is required during construction to enable the station to remain operational. This temporary platform will then form part of the permanent station platform arrangement. This will result in impacts to properties on Cope Street to the south of Annerley Road. Table 6.11 presents a summary of the likely changes to the environmental effects during construction and operation from the Proposed Changes compared to the Evaluated Project.



**Table 6.11. Effects of changes in the Dutton Park Station**

Aspect	Changed Environmental Effect - Construction	Changed Environmental Effect - Operations
Transport	No changed effect	Beneficial effect
Property	Increase – refer below	Beneficial effect
Soils, Geology and Geomorphology	No changed effect	No changed effect
Landscape and Visual Amenity	Increase – refer below	Beneficial effect
Nature Conservation	No changed effect	No changed effect
Hydrology	No changed effect	No changed effect
Air Quality	No changed effect	No changed effect
Noise and Vibration	Increase – refer below	Increase – refer below
Cultural Heritage	No changed effect	No changed effect
Social	Increase – refer below	Consistent - refer below

## TRANSPORT

Changes to the evaluated scope for Dutton Park Station are proposed to enhance accessibility for pedestrians. Upgrades will include a new overpass that will keep users away from the traffic at Annerley Road and will provide an integrated pathway for independent access to the boarding platforms. Upgrades also include improvements to the level of service of the platforms by increasing the loading/unloading areas. The impact on commuters and vehicle traffic has been reduced by relocation of the overpass.

## PROPERTY

The relocation of Dutton Park Station will result in impacts to two additional sites located to the south of Annerley Road. Those sites are zoned as CR2 Character Residential (Infill housing) and comprise a mix of existing stand-alone and multi-unit dwellings. Post construction these areas will be landscaped or offered for future residential development.

## LANDSCAPE AND VISUAL AMENITY

The landscape impact has been assessed as low-moderate. The site's sensitivity would be moderate, and the magnitude of change would be low-moderate due to the surrounding context being mostly residential and commercial properties and due to existing screening around the station and Annerley Road, which limits sightlines into the rail corridor. Due to the increase in the number of affected properties (compared to the previously Evaluated Project Dutton Park Station), the landscape impacts would increase in comparison to the Evaluated Project. The majority of works will be within the rail corridor which is below surrounding ground level and less visible from surrounding land uses. However, the elevated pedestrian overpass and retaining walls would likely be visible from adjacent residential areas and roads.

The redevelopment of the impacted lots and the improved accessibility and architectural features at the station would result in a beneficial landscape impacts outcome for surrounding receptors and improvements to visual amenity.

## NOISE AND VIBRATION

Dutton Park Station construction works are predicted to result in unmitigated exceedances of up to 13 dB (day) and 21 dB (night) at surrounding residential receivers. Piling works for retaining walls are predicted to result in exceedances of up to 21 dB (day) and 29 dB (night) at surrounding residential receivers. Demolition works are predicted to result in exceedances of up to 15 dB (day) and 23 dB

(night) at surrounding residential receivers and exceedances of up to 17 dB at places of worship on Railway Terrace.

Construction noise mitigation measures will be determined as part of the construction methodology and will be consistent with the approved OEMP which will provide a reduction of 5-10 dB from mitigation measures.

The extension of Dutton Park Station to the south is expected to have negligible effect on operational noise levels in terms of noise emission. However, the existing noise barrier on the eastern side of the rail corridor south of Annerley Road (starting at Cope Street) would be required to be removed as part of the station extension, as QR guidelines require that for safety reasons, barriers shall not be built behind station platforms or any connecting pedestrian pathways. This would result in an increase in rail noise levels for receivers on Cope Street, Tamar Street and Sampson Street.

## SOCIAL

A temporary platform extension requiring additional property acquisition would have a moderate-high negative social impact due to the necessary relocation by residents/owners. Construction impacts at Dutton Park would be generally consistent with the Evaluated Project. The upgrade to Dutton Park Station would improve pathways for independent access, pedestrian access, and pedestrian comfort through a covered rail overpass. This would have a beneficial social impact compared to the Evaluated Project.

### 6.5.2 F2S Stations

Proposed Changes include the upgrade of the following existing surface stations: Fairfield, Yeronga, Yeerongpilly, Moorooka, Rocklea and Salisbury. The works will provide a new third platform on the dual gauge to support CRR operations and to provide enhanced accessibility to the existing stations. As these are new works not previously assessed in the Evaluated Project the change in impacts is therefore increased during construction. **Table 6.12** presents a summary of the likely changes to the environmental effects during construction and operation from the Proposed Changes compared to the Evaluated Project.

**Table 6.12. Effects of changes in the F2S Station upgrades**

Aspect	Changed Environmental Effect - Construction	Changed Environmental Effect - Operations
Transport	Increase – refer below	Beneficial effect
Property	Increase – refer below	No changed effect
Soils, Geology and Geomorphology	Increase – refer below	No changed effect
Landscape and Visual Amenity	Increase – refer below	Beneficial effect
Nature Conservation	Increase – refer below	No changed effect
Hydrology	Increase – refer below	No changed effect
Air Quality	Increase – refer below	No changed effect
Noise and Vibration	Increase – refer below	No changed effect
Cultural Heritage	Increase – refer below	No changed effect
Social	Increase – refer below	Beneficial effect

## TRANSPORT

The Proposed Changes include upgrades of Fairfield to Salisbury stations for improved accessibility and to provide integrated pathways for independent access. The station works are a change from the Evaluated Project, however station upgrades at certain stations were proposed in the 2011 EIS. Peak hourly traffic generation for station works is estimated at 4 to 5 vehicles per hour which would not affect

the operation of the surrounding road network. Local traffic management will be coordinated with stakeholders to ensure safety to users and construction workers.

Station upgrades will occur within the existing rail corridor and will incorporate improvements to end of trip/drop-off facilities, including better access for vehicles, upgraded carpark layouts, improved pedestrian travel paths and installation of new platforms. Operational changes are considered to provide improvements to users of the stations.

## **PROPERTY**

Generally, works will be confined to existing rail corridor and railway stations. At Yeerongpilly, footpath upgrades are proposed to be undertaken on Wilkie Street surrounding residents include both single unit and multi-unit residential dwellings. At Yeronga, some works will be undertaken in the existing station carpark to facilitate an integrated pathway for independent access. Additional temporary construction area within the Fairly Road reserve is required at Salisbury Station.

## **SOIL, GEOLOGY AND GEOMORPHOLOGY**

All F2S stations have been identified as having potentially contaminated soil because they are in the rail corridor. Soil contamination assessment will be completed prior to any civil works. Soil will remain on-site where possible to reduce the volume of soil requiring transport or disposal. No additional properties on the EMR are impacted.

## **VISUAL AMENITY AND LIGHTING**

The stations are generally located in predominately residential areas with a multi-use commercial property, with a moderate visual sensitivity and context. Construction works for the upgrades would result in a low-moderate visual magnitude of change with periods of increased visual impacts depending on the staging of construction.

The Proposed Changes to the stations involve works largely within the rail corridor. The visual impact has been assessed as low-moderate. Certain stations were not previously part of the project, and an impact evaluation was conducted within Volume 3: Technical Report: Visual Amenity and Lighting. The potential visual impact to local viewpoints as a result of the station upgrades is considered to be low-moderate (beneficial) as a result of improved access and updated architectural features at the station.

## **NATURE CONSERVATION**

Fire Ant Biosecurity Zones (FABZ) are in place in areas of Queensland to restrict the movement of materials that could spread fire ants. Under the *Biosecurity Act 2014*, individuals and organisations whose activities involve the movement or storage of fire ant carriers have a general biosecurity obligation to take all reasonable steps to ensure they do not spread fire ants. The F2S Area includes station upgrades of Fairfield, Yeronga, Yeerongpilly, Moorooka, Rocklea and Salisbury. All works within the FABZ areas will need to adhere to the requirement of the Biosecurity Act and associated Regulation, in accordance with the OEMP.

## **HYDROLOGY**

The dominant source of potential flooding for the stations is riverine flooding from the Brisbane River. Minor construction worksites would be required at all stations for the upgrade works. For all Fairfield to Salisbury stations except Rocklea, the worksites would be located outside of the 1 in 100 AEP flood extent. Rocklea Station is within the 1 in 100 AEP flood extent. For all station works, the works will be designed and implemented to avoid inundation from stormwater due to a 2-year (6hr) Annual Recurrence Interval (ARI) rainfall event and flood waters due to a 5 year ARI rainfall event, consistent with the Imposed Conditions.

The flood immunity of the Fairfield to Salisbury Stations will remain unchanged from the existing conditions. Fairfield and Yeronga Station have a flood immunity of 1 in 200 AEP which is consistent with the Coordinator-General's Imposed Conditions and environmental design requirements for above



surface train station buildings. The proposed Yeerongpilly, Moorooka, Rocklea and Salisbury Station upgrades are not able to achieve 1 in 200 AEP flood immunity due to existing track levels. At these locations, the design will ensure all critical rail systems assets will have flood immunity above 1 in 200 AEP and that the proposed station and rail alignment's flood immunity would not be less than the existing case.

All stations except Rocklea are located above the 1 in 100 AEP Brisbane River flood level, therefore no flooding impacts are predicted up to and including the 1 in 100 AEP due to the raising of the platform levels. Raising of the platform at Rocklea is not expected to cause flooding impacts as there will be negligible loss of storage.

## **HERITAGE**

There are a number of QR listed heritage values in the F2S Area, these are:

- Fairfield station (QR337);
- Fairfield platform shelter (QR335);
- Fairfield footbridge (QR336);
- Yeronga footbridge;
- Yeerongpilly station and trainmen's quarters (QR339);
- Rocklea platform shelter (QR344);
- Rocklea footbridge (QR349); and
- Salisbury Station and footbridge (QR347).

There is no vibration impact predicted at heritage sites from track works along this section of the project. Structural changes proposed for stations in this section of the corridor include raised platforms, a new third platform at Fairfield Station, new station building at all stations and new footbridges. These works are expected to result in minor impacts to the existing station fabric. The footbridges and stations require removal as part of the station upgrades.

## **AIR QUALITY**

The proposed station upgrades as part of Changed Project are not considered to be significant with regards to potential air quality impacts during construction given they are minor works (e.g. demolition of station buildings, ramps, station furniture, new canopies, raised platforms, balustrades, signage, toilets etc.). The station upgrades would have a low potential for construction phase air quality impacts and any impacts would be temporary and minor.

Although no further air quality assessment is considered necessary for the proposed station upgrades, there are sensitive receptors within close proximity to the majority of stations which require management. Therefore, air quality mitigation measures as identified in the Project OEMP are to be implemented during the construction period.

## **NOISE**

Fairfield Station construction works (unmitigated) are predicted to result in exceedances of the Project's construction noise goals by up to 16 dB (day) and 24 dB (night) at surrounding residential receivers. Piling works are predicted to result in exceedances of up to 25 dB (day) and 33 dB (night) at surrounding residential receivers. The additional platform at Fairfield Station would result in negligible change to existing operational noise levels.

Yeronga Station construction works (unmitigated) are predicted to result in exceedances of up to 12 dB (day) and 20 dB (night) at surrounding residential receivers. Piling works are predicted to result in exceedances of up to 24 dB (day) and 32 dB (night) at surrounding residential receivers. Operational noise impacts from the new crossover at Yeronga Station will result in a localised increase of noise levels with noise levels exceeding the Coordinator-General's operational noise limits at two receivers. However, the dominant noise source is freight movements on the existing dual gauge track and the increase in noise levels is less than 3 dB and therefore would not trigger the need for additional mitigation in accordance with QR guidelines.

Yeerongpilly Station construction works (unmitigated) are predicted to result in exceedances of up to 18 dB (day) and 26 dB (night) at surrounding residential receivers. No exceedances at commercial receivers are predicted. Track changes at Yeerongpilly Station will result in total rail noise levels at the closest receivers on Wilkie Street experiencing an increase, however the noise levels are still below the Project's operational noise criteria.

Moorooka Station construction works (unmitigated) for the new platform are predicted to result in no exceedances during the day, and exceedances of up to 3 dB (night) at surrounding residential receivers. Overpass construction works are predicted to result in exceedances of up to 6 dB (day) and 14 dB (night) at surrounding residential receivers.

The new platform at Moorooka Station and the realignment of the Dual Gauge track to pass on the western side of Clapham Yard will result in a decrease in noise levels compared to the existing scenario.

Rocklea Station new platform construction works are predicted to result in exceedances of up to 12 dB (day) and 20 dB (night) at surrounding residential receivers. Overpass construction works are predicted to result in exceedances of up to 16 dB (day) and 24 dB (night) at surrounding residential receivers.

Salisbury Station construction works are predicted to result in exceedances of up to 15 dB (day) and 23 dB (night) at surrounding residential receivers. Piling works are predicted to result in exceedances of up to 23 dB (day) and 31 dB (night) at surrounding residential receivers.

## **SOCIAL**

Removal of these heritage structures may have heritage impacts which may be felt by the community; however social impacts associated with this are considered to be minimal, particularly if the proposed management approach is developed in consultation with QR. Temporary road (including footpaths and road reserves) occupation and/or closures may disrupt road users, pedestrians and the general public.

The station upgrades will have a beneficial social outcome compared to the Evaluated Project due to the improved accessibility provided by the changes to platforms, carparks and pedestrian connectivity. This improves traveller amenity and social equity and access for the local community. The new station buildings will enhance visual amenity and sense of place for users.

### **6.5.3 Clapham Yard Stabling**

The Clapham Yard stabling facility and track works are a new impact not considered within the Evaluated Project. However, impacts from a similar Clapham Yard stabling facility were assessed as part of the 2011 EIS. A review of the existing surrounding environmental values against the those present during the 2011 EIS demonstrates similar values present. As such the impact assessments from the 2011 EIS are reflective of the impacts predicted for the Proposed Changes and where appropriate have been adopted for this assessment.

## **TRANSPORT**

Project changes to Clapham Yard include the reconfiguration of the existing stabling capacity, additional supporting facilities and changed internal road alignments.

Upgrades to the yard will provide improved parking capacity and integrated pathways for independent access from the carpark to the boarding platforms (at Moorooka Station). While an increase of vehicular traffic is expected on Fairfield Road due to the provision of additional parking bays at the yard, impacts to the existing road network can be mitigated with modifications to signals and minor geometric changes.

## **PROPERTY**

At Clapham Yard, approximately 10 additional commercial or industrial properties require surface acquisition. A portion of the land required is privately-owned and currently used for industrial purposes. The balance of land impacted is freehold State-owned rail corridor land. Neighbouring industrial properties may experience additional construction impacts such as noise, dust and increased traffic during construction.

## **SOIL, GEOLOGY AND GEOMORPHOLOGY**

In addition to the railyards which are listed on the EMR there are three sites on the EMR that will be impacted along Chale Street. This increases the potential for disturbance to contaminated soils. Notifiable activity for this site now includes petroleum product or oil storage and chemical manufacture or formulation. Further site contaminated land investigations will be undertaken prior to construction to determine the level of contamination and required management measures.

## **LANDSCAPE AND VISUAL AMENITY**

The site's sensitivity is low, and there would be a low-moderate magnitude of change due to the surrounding industrial and rail context. Overall the visual impacts and landscape impacts from construction and operations of Clapham Yard would increase compared with the Evaluated Project which did not include works at Clapham Yard.

## **HYDROLOGY**

Clapham Yard stabling area is affected by flooding; therefore, construction works will be designed and implemented to avoid inundation from stormwater due to a 2-year (6hr) Annual Recurrence Interval (ARI) rainfall event and flood waters due to a 5-year ARI rainfall event in accordance with the Coordinator-General Imposed Conditions.

The foundation construction works proposed for the bridge design at Moolabin Creek includes a temporary platform over the creek or from a stone fill working platform within the creek, subject to further construction planning and approvals. As identified in the 2011 EIS, construction work at Moolabin Creek is anticipated to cause impact in the order of 40mm and 90mm in the 1 in 20 AEP and 1 in 100 AEP flood events. Construction timing and adequate mitigation measures will seek to minimise flood impacts and duration.

The Proposed Change aims to achieve cut/fill balance at Clapham Yard and minimise filling in the floodplain. The rail level would be no lower than the existing mainline rail level over Moolabin Creek (this is the lowest point on the adjacent mainline). This would mean that the stabling yard may not achieve the QR stabling requirement of 1 in 100 AEP flood immunity, however would prevent reduction in Brisbane River floodplain capacity.

Further modelling is proposed in detailed design to confirm the required cut/fill balance and levels required for stabling roads and rail systems assets. It is proposed that all power and rail system assets would be at 1 in 200 AEP and all signalling assets and crew facility buildings would be at 1 in 100 AEP. The assessment of additional piers in Moolabin Creek conducted for the 2011 EIS identified negligible impacts of less than 10mm up to 1 in 100 AEP event which is expected to be consistent for the current proposed crossing.



**NOISE AND VIBRATION**

Clapham Yard construction works are predicted to result in exceedances of up to 5 dB (day) and 13 dB (night) at surrounding residential receivers. Construction noise impacts of the Proposed Changes would be expected to be consistent with or less than identified in the 2011 EIS.

In operation, the proposed Clapham Yard stabling facility will result in an increase in airborne rail noise levels at residential receivers located to the east of Ipswich Road from rail movements within the yard compared to the existing scenario, in which the yard is infrequently used. Noise levels at surrounding receivers will be below the operational noise criteria in the Environmental Design Requirements in the Coordinator-General's Imposed Conditions.

**SOCIAL**

Clapham Yard is within an area of generally industrial character, and the works to Clapham Yard are within the rail corridor proposal so are not considered to have significant social impacts. The changes to work in this location will require acquisition of 10 industrial properties between the yard and Fairfield Road. This is an additional social impact, which will affect property owners and businesses.

## 7. Environment and Planning Approvals

A number of environmental and planning approvals will be required to be obtained for the delivery of the CRR Project. Table 7.1 below provides a summary of key approvals which may be applicable to the Project.

**Table 7.1. Approvals summary**

Approval Name	Legislation	Description
<b>Early Works</b>		
Accepted development requirements (ADR) for operational work that is the removal, destruction or damage of marine plants	<i>Planning Regulation 2017</i>	For survey and geotechnical investigations in Breakfast Creek requiring marine plants disturbance
Excluded work (Coastal)	<i>Planning Regulation 2017</i>	For geotechnical investigations in Breakfast Creek (tidally influenced and within coastal management district)
Natural Assets Local Law 2003 (NALL) Approval to Interfere with Protected Vegetation	<i>Natural Assets Local Law 2003</i>	Exempt with offsets to be developed in consultation with BCC to mitigate impacts
Accepted development requirements (ADR) for operational work that is constructing or raising waterway barrier works - temporary	<i>Planning Regulation 2017</i>	For geotechnical investigations in Breakfast Creek (grey waterway), Moolabin Creek and Rocky Water Hole (both green waterways).
<b>Project Wide</b>		
Compliance with Approved Cultural Heritage Management Plan (CHMP)s	<i>Aboriginal Cultural Heritage Act 2003</i>	Applicable to construction activities that have potential to interfere with Aboriginal heritage or spiritual culture.
Species Management Program (SMP) – Low Risk	Nature Conservation (Wildlife Management) Regulation 2006	For vegetation removal that impacts breeding places of least concern species only (excluding special least concern and colonial breeders)
Clearing Permit (protected plants)	<i>Nature Conservation (Administration) Regulation 2017</i>	Clearance of all endangered, vulnerable or near threatened (EVNT) species within the project corridor
Exempt clearing notification (protected plants)	<i>Nature Conservation (Wildlife Management) Regulation 2006</i>	For clearance of vegetation within blue high-risk area of flora survey trigger map
Approval to take native wildlife (removal of wildlife)	<i>Nature Conservation Act 1992</i>	For construction activities that require the take of protected animals
Accepted building works for Building Act 1975, the Queensland Development Code and the Building Code of Australia	<i>Building Act 1975,</i>	For demolition of train station buildings and heritage structures and construction of new buildings and structures
Natural Assets Local Law 2003 (NALL) Approval to Interfere with Protected Vegetation	<i>Natural Assets Local Law 2003</i>	Exempt with offsets to be developed in consultation with BCC to mitigate impacts
Soil Disposal Permits for Contaminated Land	<i>Environmental Protection Act 1994</i>	Movement of soil from lots on the EMR/CLR

Approval Name	Legislation	Description
Weed and pest management plan	<i>Biosecurity Act 2014</i>	Construction activities within areas where restricted matters exist or where prohibited matters are located
<b>Mayne Area</b>		
Quarry material allocation notice	<i>Coastal Management and Protection Act 1995</i>	Removing quarry material from State coastal land under tidal water (construction of new bridge piers)
Operational Works (Removal, destruction or damage of marine plant, constructing or raising waterway barrier works, prescribed tidal works) development permit	<i>Planning Regulation 2017</i>	For removal and replacement of QR suburban track bridge (truss bridge) within Breakfast Creek (new DA to be lodged)
Operational Works (Removal, destruction or damage of marine plant and prescribed tidal works) development permit	<i>Planning Regulation 2017</i>	For drainage outlets, excavation and demolition of existing buildings over Mayne Yard
Accepted development requirements (ADR) for operational work that is constructing or raising waterway barrier works – temporary waterway barrier works	<i>Planning Regulation 2017</i>	For Breakfast Creek construction activities
Flying-fox roost management permit (FFRMP) or Code of practice – low impact activities	<i>Nature Conservation (Administration) Regulation 2017</i>	For vegetation removal associated with drainage outlets, excavation and demolition of existing buildings over Mayne Yard
Operational Works (Removal, destruction or damage of marine plant, constructing or raising waterway barrier works, prescribed tidal works) development permit	<i>Planning Regulation 2017</i>	<ul style="list-style-type: none"> <li>For construction of new bridge, excavation within waterway and construction of bund</li> <li>Removal of existing QR bridge (no replacement)</li> <li>Removal of bridge deck from existing unusable QR Sidings bridge</li> </ul> <p>Sought instead of operational works permit for the replacement of QR suburban bridge.</p>
Quarry material allocation notice	<i>Coastal Management and Protection Act 1995</i>	Removing quarry material from State coastal land under tidal water (for construction of Bridge and flood mitigation)
Flying-fox roost management permit (FFRMP) or Code of practice – low impact activities	<i>Nature Conservation (Administration) Regulation 2017</i>	For vegetation removal associated with construction of bund on northern bank of Breakfast Creek.
<b>Northern Area</b>		
Material change of use on contaminated land for commercial use with accessible underground facility	<i>Planning Regulation 2017</i>	Exhibition Station underground plaza
Development on Queensland Heritage Place by the State or Exemption Certificate to carry out work on a place listed on Heritage Register	<i>Queensland Heritage Act 1992</i>	Construction and permanent works over Brisbane Exhibition Grounds and Ekka train station



Approval Name	Legislation	Description
Exemption Certificate or development on Queensland Heritage Place by the State	<i>Queensland Heritage Act 1992</i>	Construction and permanent works over Victoria Park
Impacts to public passenger transport facilities permit	<i>Transport Infrastructure Act 1994</i>	Construction activities under Inner Northern Busway Bridge off Bowen Bridge Road
<b>Southern and F2S Area</b>		
Biosecurity Instrument Permit or General Biosecurity Obligation (GBO)	<i>Biosecurity Act 2014</i>	For earthworks within fire ant biosecurity zone 2 (Yeronga, Yeerongpilly, Moorooka and Salisbury)
Operational Works (Constructing or raising waterway barrier works) development permit	Planning Regulation 2017	For Moolabin Creek Bridge (north of Moorooka Station) – green waterway
Accepted development requirements (ADR) for operational work that is constructing or raising waterway barrier works – temporary waterway barrier works	Planning Regulation 2017	For Moolabin Creek construction activities (i.e. bed level crossing)

## 8. Proposed Condition Changes

The Coordinator-General's Imposed Conditions for the Evaluated Project are presented in Appendix 1 of the Coordinator-General's Change Report dated March 2019. This section sets out the Proposed Changes to the Imposed Conditions and the reasons for the proposed condition changes.

### 8.1 Imposed Condition 1 - General Conditions

#### 8.1.1 Reason for Requested Change to Condition

It is requested that Condition 1 be amended to incorporate the Proposed Changes in this Request for Project Change, including by removing reference to the Volume 3 Design Drawings publicly notified in April 2017, as the Design Drawings have been superseded by this Request for Project Change.

#### 8.1.2 Requested Change to Condition

Amend Condition 1(a) to:

- a) delete the following words in (i) "...including the amended Volume 3 Design Drawings publicly notified in April 2017"
- b) include a new (iv) "amendments to the Project identified in the Cross River Rail Request for Project Change dated April 2019".

### 8.2 Imposed Condition 6(c) – Reporting

#### 8.2.1 Reason for Requested Change to Condition

It is proposed to change the required submission period for the monthly report from 4 weeks to 6 weeks, to allow adequate time to collate, prepare and present the information and complete internal technical and quality reviews and publication approvals required by the Delivery Authority's management procedures.

#### 8.2.2 Requested Change to Condition

(c) The Monthly Report must be provided to the Coordinator-General and the Environmental Monitor and made available on the project website within six weeks of the end of the month to which the report relates, and continue to be available on the project website until commissioning is complete.

### 8.3 Imposed Condition 10 – Hours of Work

#### 8.3.1 Reason for Requested Change to Condition

With the addition of Project worksites, Condition 10 - Hours of Work needs to be amended in order to authorise construction hours that balance amenity considerations against the need to deliver the project in a timely and efficient way.

A further amendment to Condition 10 - Hours of Work is required to clarify that the authorised construction hours for Dutton Park (track connections) is also intended to include the works necessary for the station upgrades. Therefore, the deletion of the words "(track connection)" with respect to Dutton Park Railway Station is also requested.

It is requested that Table 1 of the Imposed Conditions be amended to include construction hours for the additional worksites as follows: following additional worksites.

### 8.3.2 Requested Change to Condition

**Appendix 1 - Table 1. Construction hours**

Worksite	Surface works—standard hours	Extended work hours	Managed Work	Spoil haulage and materials/equipment delivery
Fairfield, Yeronga, Yeerongpilly, Rocklea and Salisbury Stations	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
Moorooka / Clapham Yard	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	Monday to Saturday, 6:30am - 6:30pm	For approved rail possession - 80 hours continuous works	n/a	24 hours, 7 days, except for: Monday to Friday 7:00am - 9:00am, 4:30pm - 6:30pm

## 8.4 Imposed Condition 14 - Traffic and transport

### 8.4.1 Reason for Requested Change to Condition

It is requested to amend Imposed Condition 14 to:

- require that the road safety assessment for the spoil haulage route be delivered as part of the CEMP, rather than the OEMP, to allow haulage routes to be identified prior to the road safety assessment; and
- require local traffic management measures for the areas impacted by new works.

### 8.4.2 Requested Change to Condition

#### Condition 14. Traffic and transport

(f) The Construction Traffic Management Plan must be supported by a road safety assessment for the spoil haulage route.

(h) The Construction Traffic Management Plan must include:

(iii) local traffic management measures developed in consultation with BCC for key intersections: ...

(E) in the area of the F2S and Clapham Yard works;



## 8.5 Schedule 1 Environmental Design Requirement 3 - Noise and Vibration

### 8.5.1 Reason for Requested Change to the EDR

It is requested that Environmental Design Requirement 3 be amended in order to:

- a) add supporting text below the criteria established in EDR 3(a) to clarify the measurement of railway surface track airborne noise emissions, consistent with the QR Single Event Maximum;
- b) amend Table 6 to clarify that the ground-borne noise criteria apply to in tunnel rail, and not to surface rail, consistent with the existing network.

### 8.5.2 Requested Change to the EDR

It is requested that the following changes be made to Environmental Design Requirement 3.

1. Add the following supporting text below the objectives identified in Environmental Design Requirement 3(a):

*The Single Event Maximum (SEM) Sound Level will be calculated as follows:*

- *If the number of single events due to train passing is larger than 15 over a 24-hour period, use the arithmetic average of the maximum levels for the highest 15 events.*
- *If the number of single events due to train passing is equal to or less than 15 over a 24-hour period, use the arithmetic average of the maximum levels for all the train events (e.g. if a total of 13 passes occur over a 24-hour period, use the arithmetic average of all 13 movements).*

*Noise modelling or monitoring activities aimed at assessing performance against the Planning Levels must be undertaken 1 metre from the most exposed façade of an affected building and 0.5 metres below the eave height.*

2. Amend the heading to Table 6 so that the criteria apply to tunnels and underground stations, not to surface works, consistent with the balance of the network. The heading should read "Ground-borne noise design criteria (rail operations) - tunnels and underground stations).

## 9. Conclusion

As with the Evaluated Project, the Changed Project will deliver significant transport benefits to South East Queensland by increasing the capacity and reliability of the inner-city rail system. Since the assessment of the Evaluated Project, the Cross River Rail Delivery Authority has sought proposals from bidders to deliver the CRR Project, and has undertaken further investigations into project delivery and design to maximise the benefits of the CRR Project. Compared to the Evaluated Project, the Changed Project will deliver a broader range of benefits and opportunities, including:

- changed construction methodologies, which will further mitigate the construction impacts of the project through increasing the length of mined tunnel and reducing the length of cut-and-cover tunnel for Cross River Rail;
- realigning the underground stations to allow opportunities for co-location with stations for the proposed Brisbane Metro Project at Roma Street and Boggo Road, and upgrades to the Inner Northern Busway to allow co-location with the underground station at Roma Street, providing for improved transfer opportunities between different transport modes;
- upgrades to surface stations between Fairfield and Salisbury, providing enhanced accessibility to rail services for those local communities;
- realignment of the Cross River Rail tunnels, to be straighter, improving operations and reducing maintenance costs; and
- broader network upgrades, including the provision of a rail stabling yard at Clapham, an improved stabling facility at Mayne Yard and additional bridges over Breakfast Creek and Moolabin Creek, to facilitate increased capacity and operational flexibility.

The construction impacts of the Changed Project are generally similar to the Evaluated Project. Due to changes in alignment, and the extension of the Changed Project to include surface stations between Fairfield and Salisbury, and the Clapham stabling yard, some new areas will be impacted, and some other areas relieved of project construction impacts.

Construction impacts will vary over time during the approximately 5-year construction period. Compared to the Evaluated Project, construction impacts from the Changed Project will include:

- changes to property impacts, with an increase in the number of surface acquisitions, a reduction in the number of volumetric acquisitions, and a change in the properties that will be impacted;
- changed noise and vibration impacts to nearby residents, as a result of changes to surface works, tunnelling works, and works in the rail corridor that will be undertaken outside of standard construction hours to minimise interruptions to services;
- changed traffic impacts as a result of changed and increased haulage and other construction vehicles travelling to and from the project worksites, and local traffic changes that are required to accommodate changed and new construction worksites;
- changed surface water impacts, particularly associated with the construction of new bridges at Moolabin Creek and Breakfast Creek; and
- changed, and generally reduced, impacts on State, local and QR heritage places.

The Evaluated Project is subject to a number of Imposed Conditions, that are directed at ensuring a balance between the delivery of the project and providing a reasonable amenity for communities that will be impacted by construction. As part of those Imposed Conditions, the Coordinator-General has also established Environmental Design Criteria that are required to be achieved in order to manage the operational impacts of the CRR Project.

In accordance with the Imposed Conditions, the Coordinator-General has approved an Outline Environmental Management Plan that establishes the environmental outcomes and performance criteria that must be achieved by the proponent throughout construction. Detailed Construction Environmental Management Plans that are consistent with the approved Outline Environmental Management Plan will be prepared prior to relevant construction works. These detailed plans must be endorsed by the project's independent Environmental Monitor before relevant construction works can proceed.

The existing Imposed Conditions, including the Environmental Design Requirements and the approved Outline Environmental Management Plan, remain appropriate and relevant for the design and delivery of the Changed Project, subject to minor changes that are designed to:

- apply the Imposed Conditions to the Changed Project;
- establish construction hours for new project worksites;
- provide an extended time for monthly reporting, to allow for quality assurance processes to be followed; and
- ensure ground-borne noise criteria applies only to underground stations and rail and align operational noise and vibration criteria with updated standards.

The Cross River Rail Delivery Authority, as the proponent for the CRR Project, requests that the Changed Project proceed, subject to the Imposed Conditions, including the minor amendments outlined above.



