Northern Link

Further Information to Application for Project Change

Northern Link Road Tunnel Project

November 2010

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Dedicated to a better Brisbane

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1. Introduction

The Northern Link Road Tunnel (NLRT) project, now renamed Legacy Way, was proposed by the Brisbane City Council (Council) to be a tolled cross-city tunnel, approximately 5km long, linking the Centenary Motorway at Toowong in the west of Brisbane with the Inner City Bypass and Kelvin Grove / Herston to the north of Brisbane.

A reference design and environmental impact statement (EIS) for the NLRT project were developed and evaluated by the Coordinator-General in accordance with the *State Development and Public Works Organisation Act 1971*. The Coordinator-General recommended that the Northern Link Project as described in detail in the EIS and the Supplementary Report (**Reference Design**) may proceed, subject to the conditions contained in Appendix 1 of the Coordinator-General's Report dated April 2010.

Following an evaluation of tenders for delivery of the NLRT project, Council has selected the Transcity Consortium (**Transcity**) to design, construct, maintain and operate the project for 10 years. Transcity is a consortium of Brisbane based BMD Constructions Pty Ltd as Main Contractor supported by international sub contractors Acciona Infrastructures Pty Ltd (Acciona) and Ghella Pty Ltd (Ghella). The tendered design by Transcity (**Changed Project**) would be substantially the same as the Reference Design, and would remain consistent with the project objectives. The Northern Link Project continues to be a motorway link connecting the Centenary Motorway at Toowong in the west, with the Inner City Bypass (**ICB**) at Kelvin Grove/ Herston in the east, constructed mostly in tunnels beneath the inner western suburbs of Brisbane. However, there are a number of proposed changes from the Reference Design for which an application for project change is required.

An application for project change was submitted to the Coordinator-General on 25 October 2010, which described and assessed the differences between the Reference Design and the Changed Project. Public notice of the Request for Project Change was given by way of a notice in the *Courier Mail* on 30 October 2010. The submission period closed on 19 November 2010.

The Coordinator-General has already recommended that the Northern Link Reference Design proceed subject to the recommendations and conditions provided in the Coordinator-General's EIS Evaluation Report of April 2010. The Application for Project Change did not reassess issues which relate to the NLRT Project in general which have not changed from the Reference Design.

This report has been prepared in response to a request from the Coordinator-General for further information on the project changes, after consideration by the Coordinator-General of the submissions received from the community. Responses to agency submissions will be addressed in a separate report. This report is not a stand alone report and should be read in conjunction with the Application for Project Change October 2010 report.

This report follows the structure of the Request for Project Change report, to allow for easy reference. If a section has been left blank in this report there has been no request for further information by the Coordinator-General relevant to that section.

1.1. Background

Submissions questioned the financially viability of the Project, stating that the NLRT Project represents poor value for money for Brisbane ratepayers. Submissions noted that the Project's cost-benefit ratio of approximately 1:2 is poor value for money when compared to off-road bike paths in the range of 1:2.94 to 1:3.88. The issue that toll charges would reduce the NLRT value and potential of the tunnel to reduce congestion was also raised.

These issues relating to cost-benefit ratio and use of toll charges were assessed as part of the EIS process for the Reference Design and are still relevant to the Changed Project.

The Coordinator-General has already recommended that the Northern Link Reference Design proceed subject to the recommendations and conditions provided in the Coordinator-General's EIS Evaluation Report of April 2010. The Application for Project Change did not reassess issues which relate to the NLRT Project as a whole and which do not change with the Changed Project.

The project benefits are broadly unchanged, however the project's cost-benefit ratio has improved due to the lower cost for the Changed Project compared to the Reference Design.

1.2. Project Change Process

1.3. Approvals for the Project

1.4. Consultation

Issues or concerns raised in submissions relating to the consultation process included:

- *Inadequate responses were provided for requested information and inadequate engagement with the community in important matters to the community*
- *Some persons concerned about the park did not know about the Application and the three week consultation program was not adequate.*
- *The newly affected property owners have not been adequately consulted with and therefore could not accurately identify the impacts of the changed alignment on their property.*

To support the Application for Project Change process, Council undertook a range of targeted government agency and community engagement in relation to the Changed Project, both in preparation for and during the public notification period as required by the Coordinator-General.

As required by the Coordinator-General for the public submission period, Council:

- Prepared and placed advertisements in local and metropolitan newspapers advising of the changes to the Project.
- Conducted two information sessions on Saturday 6 November and Wednesday 10 November for members of the community. Information sessions were widely advertised in local newspapers and held at Milton State School. Significant effort was made in providing a large number of senior staff involved in the Project to cover all areas of enquiries on each of the days, such as land use, geotechnical, traffic arrangements and community engagement. Approximately 200 members of the public attended the information sessions.
- Distributed newsletters featuring information on the changes to the Project and how they could find out more information, including:
  - 40,000 technical newsletters distributed to the study corridor and beyond; and
  - 70,000 high level newsletters distributed to the wider catchment area.
- Set up static displays which included the following materials:
  - A3 poster announcing the Application for Project Change
  - Two copies of the Application for Project Change
  - Two copies of project maps and urban design drawings
  - CD of the Application for Project Change.

Static displays were set up at the following locations:

- Libraries:
    - Toowong Library – Toowong Village Shopping Centre, 9 Sherwood Road, Toowong
    - Indooroopilly Library – Level 4, Indooroopilly Shopping Centre, 318 Moggill Road, Indooroopilly
    - Mt Coot-tha Library – Administration Building, Mt Coot-tha Botanic Gardens, Mt Coot-tha Road, Toowong
    - Grange Library – 79 Evelyn Street, Grange
    - Brisbane Square Library – Brisbane Square, 266 George Street, Brisbane
    - Ashgrove Library – 87 Amarina Avenue, Ashgrove
- Ward offices:
    - Toowong Ward Office – 50 High Street, Toowong
    - Central Ward Office – Shop 11, 31 Duncan Street, Fortitude Valley
    - Walter Taylor Ward Office – 70 Station Rd, Indooroopilly
- State and Federal Electorate offices:
    - Mt Coot-tha State Electorate Office – 76 MacGregor Terrace, Bardon
    - Brisbane Central State Electorate Office – Unit 2, Hill House, 541 Boundary Street, Spring Hill
    - Brisbane Federal Electorate Office – Shop 1, 209 Days Road, Grange
    - Ryan Federal Election Office – 636 Moggill Road, Chapel Hill.

Additional consultation activities for the public submission period included:

- Mailed letters to key stakeholder groups notifying them of changes to the project, consultation activities and how they could find out more information. The key groups included:
    - Affected property owners
    - Residents in the vicinity of Anzac Park
    - Residents in the vicinity of the Eastern connection (Normanby Terrace, Victoria Park Road)
    - Residents in the vicinity of the TCC
    - Residents in close proximity to the proposed site office.
- Updated Council and EIS websites with information including maps and drawings of the proposed changes to the project.
- Managed calls and emails via the 1800 enquiry line and email facility and responded to all community enquiries in timely manner.

The three week submission period from 30 October to 19 November 2010 provided by the Coordinator-General is consistent with change process submission periods for similar major infrastructure projects.

Combined with the targeted engagement and notifications described above, it is considered that the Application for Project Change provided sufficient information to inform any interested parties of the potential impacts arising from the intended use of Anzac Park for temporary workforce parking, and sufficient information for the Coordinator-General to assess the likely impacts of the temporary construction car park in Anzac Park in accordance with the *State Development and Public Works Organisation Act 1971*.

2. Overview of Changed Project

The differences between the Reference Design and Changed Project are outlined and assessed in the Application for Project Change report.

The Changed Project is generally consistent with the Reference Design and would accord with the approval and conditions provided in the Coordinator-General's Report. Changes proposed to the Reference Design and project delivery would provide an improved outcome for Council and the people of Brisbane. Those changes include design changes, such as the configuration of surface road network connections, the alignment of the main tunnels, location of tunnel portals and supporting infrastructure, and different property access requirements.

The Changed Project also revises the way in which the Project would be delivered, including changes to the layout and access/egress arrangements with construction worksites, improvements regarding traffic switch sequencing to minimise disruption to motorists, minor changes to spoil management and the improved provision for temporary off-street construction workforce car parking.

2.1. General Arrangement

2.2. Main Alignment

2.3. Western Connection

2.4. Eastern Connection

2.5. Spoil handling, haulage and placement

Issues and concerns raised in submissions included the suggestion that all project truck movements should be confined to the hours of 6.30am to 6.30pm whether or not for the transport of spoil.

The Changed Project does not alter the proposed hours of operation for truck movements from the Reference Design. The Coordinator General's condition 16 relating to traffic management and hours of operation remain relevant and appropriate to the changed project.

Normal truck haulage (Surface Works) is based on standard construction hours (6.30am to 6.30 pm Monday to Saturday). Spoil from the driven Tunnel Boring Machine (TBM) tunnel construction would be handled within the acoustic shed at the western end of the site and spoil which is not to be disposed of at the quarry will be hauled out along the approved routes between the hours stipulated in the Coordinator-General's conditions Schedule 3 condition 16 between 6.30am Mondays to 6:30 pm Saturdays and at no time on public holidays or Sundays provided the relevant noise limits in condition 22 can be met and will also avoid as far as possible the morning and afternoon peak hours.

3. Project Changes to Main Alignment

3.1. Changes to Design – Main Alignment

Issues and concerns raised in submissions included that the Application for Project Change does not adequately justify the need for the proposed alignment change, especially considering that 269 properties are newly affected.

The changed alignment provides a straighter and more direct connection between the Centenary Motorway and the ICB and will involve much less disruption to traffic during construction than the Reference Design.

The Changed Project design also has flatter grades within the main tunnels compared to the Reference Design, making for more efficient movement of traffic through the tunnels, especially heavier commercial vehicles, reducing emissions and providing a safer, more reliable traffic flow.

Any change to the horizontal alignment of the tunnels will lead to a change to affected properties. The justification for the changes to the alignment is not directly related to the number of affected properties, but a consequential effect of the changed alignment is that fewer properties are affected overall.

The extent of impact on newly affected properties is described in the Application for Project Change, which also sets out the mitigations to be applied to those impacts consistent with the EIS and Supplementary reports.

3.2. Changes to Delivery – Main Alignment

3.3. Effects of Project Changes – Main Alignment

Issues and concerns raised in submissions included that the alignment will place undue development constraints upon Rosalie Village and that the vertical and horizontal alignments have significantly changed from the Reference Design, altering the impacts of the project.

The area bounded by Baroona Road, Elizabeth Street, Carrington Street and Howard Street, is referred to under the Ithaca Local Plan as the Rosalie Village Special Area. It is partially designated as a local convenience centre, and is surrounded by low-medium density residential development and the adjacent Milton State School. At Rosalie Village the Local Plan does not support any increase in development density, nor any intensification of development in terms of height, bulk or scale. The Local Plan does not support the type of development likely to involve deep excavation (eg for basement car parking) or building heights where the development itself, or the tunnel greater than 20m beneath might be structurally compromised. The Changed Project will therefore not impact on the planning principles and objectives of the Local Plan as the tunnel depths and location do not compromise any existing development rights.

The alignment of the Reference Design as assessed in the EIS can be altered providing the necessary approvals required for those changes are granted by the Coordinator-General, consistent with the requirements of the *State Development and Public Works Act*. The alignment of the tunnels used in the Reference Design provided a clearly described "reference alignment" from which an assessment of potential construction impacts such as groundwater drawdown, settlement, vibration and regenerated noise could be made. These impacts were evaluated by the Coordinator-General in the Coordinator-General's Report on the NLRT. Whilst the impacts have moved as a result of a change in alignment of the tunnels', the Coordinator-General's conditions remain appropriate and relevant. The Coordinator-General acknowledged previously that "*there are likely to be impacts from noise and vibration due to the location*

of the project in proximity to residences and the nature of activities required to be undertaken in the construction of an underground road tunnel in an urban environment".

While there have been some changes in the horizontal or vertical alignment of the tunnels the evaluated impacts associated with the Reference Design and the associated imposed conditions are considered to remain relevant and adequate to allow assessment of the impacts of the Changed Project.

3.3.1. Geology and soils

Issues and concerns raised in submissions included that the Application does not provide site specific geotechnical information, but relies on assumptions based on 'regional geological maps'. It was suggested that Airport Link used a similar approach and as a result underestimated the strength of ground conditions adjacent to the Kedron on-ramps of the tunnel, with resulting higher levels of impact on the local community. Questions regarding when a more detailed elastic settlement assessment (based on CLEM7 results) would be undertaken were also raised.

Section 3.3.2 and particularly Table 3-1 of the Application for Project Change summarises the anticipated ground conditions for Changed Project. This information was based on the existing geotechnical investigation information undertaken for the Project. This included boreholes on the Changed Project alignment as well as boreholes laterally located off the Changed Project alignment. All geotechnical information obtained to date, spread throughout the study corridor has indicated that there is a high degree of consistency with respect to the geological conditions surrounding the tunnel, including rock weathering, rock strength and rock jointing. Additional geotechnical investigations will be undertaken during the detailed design phase, prior to construction, particularly in the shallower cover locations, and appropriate risk mitigation measures will be implemented in the design and construction of the tunnel should these additional geotechnical investigations show unanticipated results.

As discussed in Section 3.3.2 of the Application for Project Change, it is noted that the proposed construction technique for the Changed Project involves the use of a TBM to install precast concrete segments. This construction technique is able to readily adapt to varying geological conditions (should they be encountered) and the precast concrete segments provide immediate, stiff and strong support to the surrounding ground conditions, thus limiting the impacts associated with tunnelling within variable geological conditions (should they be encountered).

The geology and the construction methods for the Project are different to the circumstances for the Airport Link Project and the Airport Link circumstances are not considered directly relevant. Airport Link is using road header construction for significant sections of the main tunnel alignments and the geology for Airport Link at the eastern end includes more challenging softer geological materials. This Project will be constructed in hard rock using TBMs for the main tunnels.

With respect to a more detailed elastic settlement assessment (based on CLEM7 results), as discussed in Section 3.3.2 of the Application for Project Change, it is noted that the Changed Project elastic settlement assessment (and subsequent impacts) was based on the actual settlement results monitored during construction of the CLEM7 tunnel boring machines. A more detailed elastic settlement analysis will be undertaken during the detailed design phase (prior to construction) of the Changed Project after completion of the geotechnical investigations and detailed design of the tunnel support. That analysis will be updated during construction based on observations consistent with the approach used for Clem7.

3.3.2. Hydrology (groundwater)

Issues and concerns raised in submissions included that information on groundwater draw down and in-flow for the concept design is based on the reference design, and updated predicted property impact information has not been provided for the changed Project.

Groundwater drawdown is anticipated to be less for the Changed Project and would require no change to the existing conditions (refer to Section 3.3.3 Application for Project Change) Whilst the groundwater drawdown area has moved as a result of a horizontal change in location of the tunnels, the Coordinator-General's conditions remain appropriate and relevant. The Coordinator-General, in the evaluation of the Reference Design was satisfied that the potential impacts associated with groundwater will be adequately addressed through imposed Condition 21 – Groundwater and Surface Water, Schedule 3, Appendix 1 and the requirement for implementation of the Construction EMP Groundwater and Surface Water Sub-Plans.

In particular:

- Condition 21(d) requires the proponent to take all reasonable and practicable measures to minimise impacts from groundwater movement on property and further,
- where it is identified that property damage has occurred as a consequence of the construction works, Condition 21(e) requires the proponent to repair such damage as soon as practicable and in consultation with, and at no cost to, the property owner(s).
- Condition 21(f) requires monitoring of groundwater flows during construction and for a period of five years after commencing operation. The predictive modelling used to site the monitoring is to include the potential, albeit remote, of inflow from the Brisbane River.

3.3.3. Noise and vibration

Issues and concerns raised in submissions included:

- *The impacts of tunnel construction vibration and settlement on residential properties located above the alignment, particularly older and heritage-listed homes, and also within the Toowong Cemetery and questions on confirming relevant management and mitigation measures which would be implemented.*
- *The shallow depth of construction in some areas and concerns that vibration would possibly reach levels of 1-2 mm/sec PPV, including the areas either side of the low point drainage line or adjacent to 8th Avenue.*
- *The measured CLEM7 construction vibration impacts suggest that the Project EIS vibration estimates were overly conservative, and measured construction vibration data from other tunnels should be found to verify this.*
- *The estimates for 5mm elastic settlement in the Reference Design is significant and could impact within the Toowong Cemetery on graves and obelisk-type monuments which were typically constructed without pinning, and are higher in number in the newly impacted portions 11 and 12 of the Cemetery. It was suggested that preventative pinning of these monuments is preferable to dismantling them for the duration of construction.*
- *Construction vibration could affect the unnamed creek that drains the Cemetery, and the Project should be designed to be a minimum of 8 metres from the natural bed of the creek not the stated 6.8m in the Application for Project Change.*

- *The noise from the TBMs was likely to go above the threshold stipulated in the Co-ordinator General's report.*

The alignment of the tunnels used in the Reference Design provided a "reference alignment" from which an assessment of potential construction settlement, vibration and regenerated noise impacts could be made. The Changed Project will use very similar tunnel construction methodologies to the Reference Design and the new alignment contains a similar but different range of residential properties located above the alignment, including a similar range of older and heritage-listed homes as identified in the Reference Design.

Typical impacts were evaluated by the Coordinator-General in the Coordinator-General's Report on the NLRT. Whilst the impacts have moved as a result of a change in location of the alignment of the tunnels, the Coordinator-General's conditions remain appropriate and relevant. The Coordinator-General acknowledged that "*there are likely to be impacts from noise and vibration due to the location of the project in proximity to residences and the nature of activities required to be undertaken in the construction of an underground road tunnel in an urban environment*".

A full range of appropriate and relevant management and mitigation measures were identified in the Coordinator-Generals Report referred to in the Application for Project Change and available on the Department of Infrastructure and Planning and project web sites. These management and mitigation measures are all still applicable to the Changed Project.

An extensive literature search was conducted as part of the road tunnel projects undertaken in Brisbane over recent years. Taking into account the two important factors of (1) rock strength and (2) the diameter of the TBM, the most relevant reference that has been found during those searches relates to the excavation of the Dublin Port Motorway Tunnel (see Section 6.5.2.2 of the Construction Noise and Vibration Technical Report for more details). The empirical data reported for the Dublin Port Motorway Tunnel for construction regenerated noise and vibration formed the basis of the EIS source levels. Based on measured vibration data collected during construction of the CLEM7 tunnel, the impacts of Changed Project has been updated using this Brisbane information. Measured regenerated noise data within residential properties was not collected during the CLEM7 construction, hence the continued use of the Dublin Tunnel data for this purpose.

Within the Toowong Cemetery extensive geological investigation will be carried out as part of the detailed design process over the section of tunnel below the natural valley where the minimum depth of some 6.8m from the natural bed of the creek has been identified to enable an accurate assessment of the geology in this area to be completed. After assessment and confirmation of the depth and quality of rock in the area the design will be finalised and an accurate prediction of potential settlement and vibration levels expected at this location during tunnelling will be made. A complete assessment will then be made of the graves/monuments in the area to assess their structural integrity and the subsequent risk of damage due to any predicted impacts from tunnelling.

The mitigation strategy will range from restoring existing monuments prior to tunnelling; propping/bracing; and ground improvement measures such as micro piling from the surface (if rock quality is found to be poor). There are a limited number of grave sites in this area and as such, this surface area could potentially provide the area required for ground improvement works to be carried out if required.

Based on the CLEM7 vibration data, driven tunnelling vibration levels (using the TBM) are predicted to be up to 1mm/s at the shallowest points of the Changed Project. At such levels, the vibration may be "discernable" to building occupants and may cause audible "rattling" of loose fitting household items such as crockery and loose fitting windows. However, at these levels, there is no risk of damage (either cosmetic or structural) to the buildings themselves – even for heritage listed properties.

In some locations, the predicted regenerated noise levels from TBM driven tunnelling for the Changed Project may exceed the goals in the Coordinator-General's Conditions, as was the case for the Reference Project. Measurements to improve the accuracy of the predictions and mitigation (eg temporary relocation of residents) measures, in combination with robust community consultation, will be implemented to address any predicted noise level exceedences.

3.3.4. Planning and land use

Issues and concerns raised in submissions included adverse property price impacts due to the tunnel passing underneath people's property.

Property values are influenced by a broad range of factors, including external factors. Any direct financial impacts from the acquisition of volumetric title as part of the Project will be addressed in the purchase of that volumetric title. In many cases there will be little or no impact on values as the Project will no affect existing development opportunities or result in discernable impacts during operation. A fair and transparent process has been used on other similar tunnel projects in Brisbane and that process remains unchanged for the Changed Project.

3.3.5. Cultural heritage

Issues and concerns raised in submissions included that within the Toowong Cemetery Portion 16 is densely buried and there are a number of recent burials in portion 17 along 14th avenue. Project vehicles driving through these areas would create significant impact on these graves. It was suggested that the Project should access the creek area via 8th avenue. It was also suggested that the area where the creek crosses the tunnel corridor contains headstones removed from other portions and used as fill in the period 1974-1976, and that all of these headstones should be extracted from this section of the creek bed.

Restoration of headstones is not required as a consequence of the Project. A Cultural Heritage Management Plan (CHMP) is required to be prepared prior to any construction works commencing within the Toowong Cemetery in accordance with Appendix 1 Schedule 1 Condition 2 "Development on a State Heritage Place" of the Coordinator-General's Report. These comments will be taken into consideration as part of the preparation of the CHMP.

4. Project Changes to Western Connection

4.1. Changes to Project Design – Western Connection

Issues and concerns raised in submissions included the Centenary Motorway being marked as a traditional left side 'exit' ramp configuration despite carrying the major traffic flow, with the suggestion that the Centenary Motorway should be marked as a right hand 'exit' ramp from the Centenary Motorway to the NLRT, similar to that constructed for the Pacific Motorway tunnel ramp to CLEM7. An additional comment was made that the Centenary Motorway should be upgraded to six lanes to adequately manage traffic flow.

It is Department of Transport and Main Roads preference in the short to medium term that the Centenary Motorway (southwest of the NLRT connection) and NLRT together become the primary southwest-northeast motorway corridor and that in the long term the Centenary Motorway and the Inner Orbital will together become the priority route. Consequently, the pavement line marking for NLRT indicates priority to NLRT as the through carriageway. However, should traffic operations indicate that the Centenary Motorway (northeast of the NLRT connection) have priority, then the pavement line marking can be modified to suit with no impact on the design of the NLRT connection.

4.2. Changes to Delivery – Western Connection

4.2.1. Worksite Layout and Construction Areas

4.2.2. Workforce Car Parking

4.2.2.1. Construction project office and visitor centre

The Application for Project Change identified a site along Sir Samuel Griffith Drive between Mt Coot-tha Road and Simpsons Road to establish the construction project office and visitor centre, which was shown in **Figure 4-4** of the report. This requirement has been revised and the project office and visitor centre is no longer proposed for this location. The project office and visitor centre would be established within an existing commercial office area. If required, development approval for the construction project office would be sought, in accordance with the *Sustainable Planning Act 2009* and City Plan at a later date.

4.2.2.2. Anzac Park temporary construction workforce car park

A number of submissions were received during the public notification process which raised issues with the proposed Anzac Park temporary off street parking area. These issues are summarised under the relevant subject heading in **Section 4.3** below.

Vehicle access to the proposed Anzac Park temporary off street parking area has been reviewed in response to the submissions received on the Changed Project. Access to the temporary parking area would be restricted to a two way flow between the Dean Street entry/exit and the proposed parking area and would not use the full one way circuit through the park.

The Application for Project Change describes a workforce parking area suitable for up to 300 vehicles. The actual number of car parks required in Anzac Park is now expected to be no more than 200 spaces. It is now proposed to also use the existing overflow carpark for the Botanic Gardens off Mt Coot-tha Road as proposed in the Reference Design. The footprint of the temporary car park in Anzac Park would be reduced as much as practicable to accommodate 200 car parks.

The two way section between Dean Street and the Anzac Park car park entry would be approximately 160 metres in length. The initial proposed access within the Application for Project Change covered an

access length of approximately 850m from Dean Street to the car park entry and then a 160m route exit to Dean Street.

The entry lane of the two way section of the access road would be restricted to construction workforce vehicles providing direct access to the carpark. Construction workforce vehicles would share the exit route with public vehicles from the car park to the Dean Street access.

The widening of the access road to form the two way section is not expected to impact on the pedestrian cycle way, however there may be some minor impact associated with the entry exit interface between the access road and the car park depending on the detailed design of the exit intersection with the public one way road. Should it be necessary to provide a temporary roundabout type intersection for safety reasons, then this may require some minor repositioning of the pedestrian and cycle path - but only over a short distance of the path (approximatley 10-20 m).

The temporary car park would be fenced. The detailed design would provide for safety barriers around the perimeter of the carpark, particularly at the bottom of slopes to protect external areas of the Park from any vehicles that are not securely parked. Additionally, the two way access between Dean Street and the temporary off street parking area would be fenced in order to clearly identify it and isolate it from public use, with a clearly marked crossing point.

Council is also proposing that an additional toilet facility would be constructed adjacent to the existing play equipment and picnic area to further improve community safety within the park. A toilet facility in this location would help to avoid adults and children crossing the proposed two way section of the internal access road between Dean Street and the car park in order to get to and from the existing toilets adjacent to Dean Street on the outside of the internal access road.

The facilities in the existing barbecue area will also be re-provided elsewhere in a more useable location within the park to maintain this public amenity.

4.2.2.3. Alternatives

The issue of alternative sites for the temporary car park was raised in the submissions as well as suggestions that construction workers should be encouraged to use public transport and park-and-ride facilities to get to the construction site.

As part of Council's commitment to minimising the impact on local residents, prepaid public transport tickets will be made available to the construction workforce by the Contractor to reduce construction-related traffic and parking demand on local streets.

Given the hours that construction staff will work, with early morning starts and late finishes, it is sometimes difficult for them to use public transport. Like many people working these hours, their preferred transport mode is often a private vehicle.

The proposed location of the temporary carpark area in Anzac Park is located close to the pedestrian and cycle bridge across the Centenary Motorway, as far as practicable from residential dwellings and avoids the play equipment and dog park.

4.2.3. Spoil Handling, Haulage and Placement – Western Worksite

4.2.3.1. Construction Truck Movements

The total estimated number of truck movements for the western connection for both the Reference Design and Changed Project are provided in **Table 4-1** below in response to information requested by the Co-ordinator General.

The total number of western truck movements due to the changes is lower than the Reference Design by some 14,950 truck movements or 4 less truck loads per hour on average. The majority of the decrease is due to the reduced number of trucks required to transport the pre-cast concrete segments to the western worksite (as proposed in the Changed Project) compared with the transport of shotcrete concrete materials in the Reference Project.

Table 4-1: Difference in total estimated construction truck loads – Western Connection

	Criterion	Number of Truck Loads	Truck Loads Per Hour
Reference Design	Spoil Haulage	20,400	6
	Tunnel Lining (Shotcrete, concrete)	25,853	6
	Invert Backfill Material	13,300	6
	Total Truck Loads Reference Design	**59,553**	**18**
Changed Project	Spoil Haulage	23,300	7
	Tunnel Lining (Rings, Grouting)	11,120	3
	Invert Backfill Material	10,200	4
	Total Truck Loads Changed Project	**44,620**	**14**
Change	Spoil Haulage	2,900	1
	Tunnel Lining	-14,733	-3
	Invert Backfill Material	-3,100	-2
	Total Difference in Truck Loads	**-14,933**	**-4**

Table Notes

1. These figures do not include truck movements for general material deliveries and tunnel components as this is not significant change from the Reference Design to the Changed Project

4.3. Effects of Project Changes – Western Connection

4.3.1. Traffic and Transport

4.3.1.1. Safety

Issues and concerns raised in submissions included that as a result of the provision of temporary workforce parking within Anzac Park increased construction vehicle movements on the 1km track in the park posed an unacceptable risk to public safety, particularly children accessing play areas and toilets. It was suggested that construction traffic would make the children's play area and barbeque area unusable.

Concern was noted that the these risks were to be addressed with a code of conduct and traffic management plan and it was suggested that only fencing and traffic marshals could render the interaction between vehicles and park safe. It was also suggested that the traffic management plans and any associated modelling should be made available to the public, and that Council should undertake a risk assessment on the temporary workforce car park. A suggestion was also made that the proposed controls are inconsistent with the obligations of the proponent under s30A(2) of the Workplace Health and Safety Act 1995 (Qld) and of Transcity under s28 of that same Act.

Further questions were raised regarding how Council proposed to ensure that the workforce, and other visitors or consultants would keep to the speed limit within Anzac Park.

The proposed access arrangements, with a two way section between Dean Street and the temporary car park, reduces the potential area of interface with the adjacent parkland and also the duration that

construction vehicles would be active within the park. In addition to the shortened access route it is also proposed to fence the access route from the Dean Street entry intersection with the one way public internal access road within the park so as to identify its use only for construction vehicles and to prevent inadvertent interaction between this access and the public users of the park.

The proposed new separate toilet block within the internal area of the park would also avoid the need for internal park users to cross the access road to access the existing toilet block located on the outside of the internal access road near the Dean Street intersection.

The proposed access arrangement removes the need for community members to cross the area of the access road being used by the construction work force.

4.3.1.2. Traffic

Issues or concerns raised in submissions relating to traffic impacts from the proposed temporary construction workforce car park included:

- *that the proposed construction workforce parking would impact on surrounding streets by rat-running because there is no right turn from Dean Street into Mt Coot-tha Road. Particular concerns for Terrace Street, Elizabeth Street, Dean Street, Miskin Street and the Frederick Street Roundabout were raised.*
- *Anzac Park related workforce traffic using Dean Street would negatively impact on cyclist safety when crossing Dean Street to access the Centenary Bikeway.*
- *It was suggested that Wool Street would receive 900 construction vehicle movements a day with no structures and very few trees screening the traffic from residents*.

Access to the temporary construction carpark would be from Dean Street only, not Wool Street. It is unlikely that construction workers would drive along Wool Street adjacent to the park. The majority of construction workers are anticipated to access Mt Coot-tha Road from Dean Street. The Application for Project Change considered the potential traffic impacts on local streets as a result of the temporary construction workforce carpark. It noted that increase in usage of the Dean Street access point is not expected to significantly affect the operation of Dean Street. It is also unlikely to impact adversely on cyclist safety in Dean Street. A Construction Traffic Management Plan would be prepared for the Changed Project during the detailed design phase, as required by the Coordinator-General's condition 15 and 16. As part of the development of this plan, the potential impacts of construction related parking in Anzac Park on the surrounding street network and cyclist safety would be further considered and appropriate mitigation and management measures developed.

4.3.1.3. Pedestrian and Cyclist Bridge

Issues and concerns raised in submissions included:

- *that the movement of 600 construction workers crossing the pedestrian and cycle bridge at shift changeover times would impact on the amenity of bridge users.*
- *the risk of conflict between cyclists and works walking across the bridge, with particular note of risks at the bridge entry where cyclists travelling in-bound along the Bikeway are travelling downhill at speeds of 40-60kph.*
- *the personal safety of female cyclists and elderly people interacting with construction workers.*

The Changed Project will have activities being undertaken on a dayshift and a nightshift basis. The activities undertaken on the nightshift will be limited to tunnelling works underground, whilst the dayshift activities will include the major surface works activities. The carpark footprint is proposed to be reduced to 200, nightshift tunnelling works are operated on a limited workforce capacity, and not all workers will arrive or leave from the carpark at the same time. It is anticipated therefore that the number of cars entering or leaving the carpark at the end and beginning of shifts will be less than 200. Although some car pooling may take place, it is likely that numbers using the pedestrian/cycle bridge at any time will be significantly less than 200.Access for existing bridge users will be maintained throughout the duration of the construction activities.

The pathways between pedestrians from Anzac Park using the pedestrian bridge and cyclists coming in-bound from the west, continuing into the city are currently segregated. The workforce from the Anzac Park carpark will use this segregated pedestrian path. Cyclists using the pedestrian bridge will be travelling at considerably lower speeds given the geometry up onto the bridge.

Protocols and procedures for all construction personnel interacting with the community will be established and implemented through ongoing workforce induction and training.

4.3.1.4. Parking

Issues and concerns raised in submissions included that construction workers may be tempted to either park in the Toowong Cemetery or on the roadside verges along Richer Street. It was suggested that visibility is poor exiting from the Richer Street gate and cars parked in this area will exacerbate the problem. It was suggested that construction workers should be required as a condition of their employment to park in designated sites.

The proposed temporary construction workforce parking areas address the issue of on street parking, by providing a dedicated off street parking area for construction workers. The location of the car park in the part of Anzac Park close to the pedestrian bridge and Centenary Motorway was carefully considered in order to identify a location which was still convenient and sufficiently practical for the workforce to minimise their temptation to park on-street in a closer vicinity, regardless of the provided parking, such as raised in the submissions. The existing overflow carpark at Mt Coot-tha Road also provides practical access.

The proposed temporary construction workforce parking areas have been included to satisfy the Coordinator-General's condition with regards to ensuring the construction workforce does not park on surrounding local streets. As noted in Section 4.3.4 of the Application for Project Change, the requirement to park in the designated parking area would be a condition of employment on the Changed Project.

4.3.2. Hydrology

Issues or concerns raised in submissions related to hydrology impacts of the Anzac Park temporary workforce car park included:

- *that it would impact on surface water runoff into the Anzac park wetland area and creek, posing an unacceptable risk to the water and the trees which are within it.*
- *that flows from catchment $C10^{50}$ were not studied in depth in the EIS because it was downstream of the construction area*
- *that if the car park is unsealed, it would exacerbate runoff pollution concerns*

Measures for the treatment of surface water run-off from the temporary workforce car park in Anzac Park would be determined during the detailed design of the project and incorporated into the surface water

quality EMP. This would include determining appropriate controls to achieve the water quality objectives outlined in the Coordinator-General's condition 21.

4.3.3. Noise and Vibration

Issues and concerns raised in submissions included the amenity impacts on surrounding residents from noise created by construction workers using the temporary construction car park in Anzac Park.

Concern was also raised that changes to the western portal alignment, including that the raised road would bring noise into the Mt Coot-tha valley, noting that while noise barriers were proposed, they would not mitigate noise directed up higher towards the quarry, which would reflect noise off the exposed rock faces into residents' homes

A noise and vibration assessment for the Changed Project was undertaken for the Application for Project Change, which included consideration of potential impacts of the temporary construction workforce parking area on surrounding residents. Section 8 of The Application for Project Change included an additional condition which is recommended to be imposed on the Project to address the potential for temporary construction workforce parking to cause nuisance.

Detailed 3D noise modelling of the new portal/transition areas will form part of the Detailed Design phase of the project. Noise mitigation would be designed and implemented to ensure compliance with the Coordinator-General's Conditions. Preliminary modelling of the new portal/transition areas has been undertaken which indicated the Coordinator-General's Conditions would be achieved with a noise barrier on the northern side of the re-aligned east-bound Centenary Motorway lanes.

Full compliance with the Coordinator-General's road traffic noise conditions will be achieved through detailed design.

The Coordinator-General's conditions addressing noise and vibration are presented in Schedule 3 conditions 22 and 31. These conditions remain relevant to the Changed Project. The Changed Project and the conditions respond to the issues raised in submissions to the EIS in relation to amenity impacts associated with the construction worksites.

A Noise and Vibration EMP Sub-Plan for construction would be developed and implemented in accordance with Condition 22. This would include monitoring requirements for the construction period. Condition 31 requires that monitoring is undertaken as part of the Operation Noise EMP Sub-Plan with the reporting made publically available.

4.3.4. Ecology

Issues and concerns raised in submissions relating to ecology in Anzac park included:

- *that the proposed workforce parking at Anzac Park poses unacceptable risk to 28 large trees at the site. It was suggested that bitumen or cars coverage for the four year construction period would destroy tree root systems,* reduce water infiltration and the amount of soil moisture available for tree survival.
- *ensuring the ongoing survival or three large fig trees adjoining the site, requesting the canopy overhang into the proposed car park be protected to ensure the ongoing survival of the significant trees as they provided much of the character of Anzac Park.*
- *clarification on which trees were classed as 'significant' as it could not be ascertained because of the lack of detail in the Application.*

- *requirement that flora surveys are undertaken prior to acceptance of the Application for Project Change and after community consultation to ensure that any flora listed as EVR under State or Commonwealth legislation will not be put at risk.*
- *that the Coordinator-General's assessment and approval of the EIS was based on the small northern boundary section assessed for the Reference Design and not the proposed workforce parking, an entirely different area affected in the internal sections of Anzac Park.*
- *suggestion that a qualified arborist should be retained for the duration of the project to monitor the health of all trees impacted by the construction of the car park.*
- *that the type of and effects on fauna in Anzac Park had not been described in the Application for Project Change and as a result it is difficult for the community to assess the likely environmental impact. It was also noted that any surveys carried out now will be too late to include the community in determining an appropriate response.*
- *Potential impacts on cockatoos residing in the Mt Coot-tha valley was also raised as of concern.*

As noted in Section 4.3.5 of the Application for Project Change, significant trees within the proposed temporary construction workforce car park in Anzac Park would be retained and protected during its construction and use. An arboriculture assessment will be conducted in accordance with AS4970:2009 Protection of Trees on Development Sites. This assessment will determine species, significance and tree protection zones for all trees within the Licensed Construction Area. The detailed design of the car park would locate the individual car park spaces to avoid the tree protection zones.

Anzac park predominately provides habitat for common urban fauna species including honey eaters, bird species such as lorikeets and passerines and arboreal mammals.

Cockatoos have a wide range of habitat and would relocate themselves to alternative areas once construction starts. As such they are not considered to be especially impacted on by the Project.

Potential impacts on flora and fauna would be managed through the flora and fauna EMP sub plan. If required, a suitably qualified fauna spotter / catcher would be present on site during construction works.

4.3.5. Cultural Heritage

Issues and concerns raised in submissions included that Anzac Park is on the Heritage Register and should be protected. It was also noted that the Park is a significant memorial to fallen soldiers in the Great War. Additionally, it was noted that there are substantial plantings by the community and council with plaques commemorating these plantings, which must be protected.

One submission stated that under Council's own Heritage Place Code in Chapter 5 of the City Plan 2000, Council is obliged to properly consider the heritage value of Anzac Park, including its cultural significance. The submission notes that Council is obliged to properly consider the impact of this proposal to build a car park on a site listed on its own Heritage Register. The submission continues that the EIS forbids heritage sites being used as a means of ingress and egress and on that basis alone the Application should be rejected.

The submission further stated that the change report did not comply with Condition 3 of the Coordinator-General's Conditions as there was no condition survey or CHMP as part of the Application. The submission stated that the Council/proponent has ignored its obligations, seeking to avoid properly addressing the clear heritage values of Anzac Park. The submission requested that the Council/proponent be required to properly address its obligation.

As noted in the Application for Project Change Anzac Park is a local heritage place listed on the City Plan 2000 Heritage Register as a site of local heritage value. The local heritage values accrue from its history of use firstly as a cemetery (19th century), then as a rifle range (20th century) and then as a memorial park commemorating those soldiers who died in World War 1. Anzac Park is now used more for its passive recreation value than for any of its other values. Apart from its inclusion in the City Plan register, the Brisbane City Council has reflected these values in the Conservation Management Plan for Anzac Park. The Conservation Management Plan notes that these values are of local importance.

Anzac Park would have been permanently impacted on its western side by the Reference Design exit tunnel and connection to the Centenary Motorway. In the Changed Project, the impact would only be temporary and would be as a consequence of providing a construction workforce car park. This construction workforce car park is proposed as a mitigation measure to address local community concerns arising from potential issues of on-street parking by works in local streets.

The indicative arrangement and location of the temporary car park has been designed to avoid the remaining trees that were planted in remembrance of the local soldiers of World War 1. The proposed arrangement also minimises the impact on other trees and vegetation in Anzac park, so that its other community values are maintained.

The trees within and in the immediate vicinity of the proposed car park have been surveyed. Although there is currently no indication that any of the trees surveyed are associated with the memorial plantings of 1918, this would be confirmed through the arboriculture assessment and more detailed survey. With the prior input of the arboricultural assessment, the temporary car parking would be designed and constructed to ensure there would be no impact on memorial trees or other significant plantings in Anzac Park.

As no memorial trees would be adversely affected, the workforce car park is only required for a period of 4 years and the area it will be rehabilitated as quickly as possible in accordance with the Coordinator-General's conditions, the Project is not considered to significantly impact on the heritage values of Anzac Park.

To address the potential impact of the temporary car park, it is proposed that a Cultural Heritage Management Plan and condition survey be prepared during detailed design of the project for the design and development of the proposed temporary parking area. This would be undertaken in accordance with the Coordinator-General's conditions and prior to any development on site.

4.3.6. Social Environment

Issues and concerns raised in submissions included:

- *that 1800 traffic movements (300 spaces emptied and filled for three shifts a day) would clog the narrow 1km traffic, effectively curtailing almost all users of Anzac Park.*
- *that the proposed workforce parking would prevent children and other park users from accessing significant parts of Anzac Park and would thereby conflict with Section 6.2.2 Access and Traffic Movement of the EIS.*
- *that the construction workforce parking would reduce sight lines, opportunities for casual surveillance and levels of activity, reducing the perceived safety of the public space, especially children without direct adult supervision and women exercising alone.*
- *that the use of part of Anzac Park for a car park would significantly impact on its continued use for orienteering, noting that as it is not a large park the loss of its core would make future course planning*

quite difficult. Concerned about the safety of orienteering members (especially young children) due to risks from traffic movements was also raised.

The proposed access arrangements, described above in **Section 4.3.1.2**, direct from Dean Street avoid the need for construction workers vehicles to utilise the full 1km access track in Anzac Park to access the car park.

The temporary car park area is located north and west of the play equipment area. The residential area of Wool Street is located south of the play equipment area. Therefore the temporary workforce construction parking area would not change existing sight lines or opportunities for casual surveillance from the residential dwellings.

It is not expected that the proposed temporary car park would significantly impact on the ability to use the park for orienteering on the basis that the area required is would be less than 6% of the total area of the park.

4.3.7. Urban Design and Visual Environment

Issues and concerns raised in submissions included that the position of the proposed workforce parking at Anzac Park car park would destroy the aesthetic beauty and the social amenity of the Park.

The proposed temporary workforce construction car park in Anzac Park is located in the northern part of park, and is separated from the play equipment area. As the area for the proposed temporary car park is located behind a topographic ridge, the car park would be partially screened from view. The reduction in footprint will also reduce visual impact. This would assist in protecting the visual amenity of Wool Street residents and the most used section of the park.

4.3.8. Planning and Land Use

Issues and concerns raised in submissions included that:

- *the proposed use for workforce parking at Anzac Park is inconsistent with Brisbane City Council's City Plan 2000 area classification of park. It was suggested that parks should not be used as land banks for infrastructure projects.*
- *the construction workforce car park is inappropriate due to the up to 16% slope gradient of the park in the proposed site location.*
- *there are no alternative green spaces in the surrounding area with similar attributes, and the Botanic Gardens open at 8am and do not allow dogs or bicycles.*
- *the EIS identified that Anzac Park would provide an important buffer zone between the Project and surrounding residential areas and that the proposed parking would destroy this buffer zone.*
- *the EIS requirement of site rehabilitation for Anzac Park was inconsistent with correspondence from Councillors and Transcity indicating the workforce parking may remain.*
- *the contractor was not obliged to reinstate the site and would only reinstate the site if convinced to do so in 2014/2015.*
- *it is inaccurate and misleading to describe the proposal as a 'temporary' car park as it has significant community cost for a very significant period.*

The use of part of Anzac Park for the purposes of the NLRT Project was approved as part of the Reference Design which included part of the park for permanent realignment of the westbound lanes of the Centenary Motorway. It is considered that the Changed Project has a reduced impact on the land use

of Anzac Park as it will only be affected by the temporary construction workforce car park. Following the end of construction of the project, the car park area would be reinstated in accordance with Condition 18 (l), imposed on the project by the Coordinator-General. This condition requires that *Construction workforce car parks must be rehabilitated as quickly as is reasonable and practicable to a standard suitable for future use of a purpose preferred in this location under the area designation in City Plan 2000*. The land is designated as park under City Plan

The total area of Anzac Park bounded by Dean Street, Wool Street, Broseley Road and the Centenary Motorway is approximately 14 hectares. With the exclusion zone for all the significant trees (refer to **Section 4.3.4**), less than 6% of the park will become temporary car park. The car park area is located in the north of the park adjacent to the recently-constructed pedestrian and cycle bridge. It is separated from the main play equipment and barbeque area of the park.

The area, which has an acceptable natural grade of 1 in 6 to 1 in 7 would be graded and stabilised with bitumen or other suitable hardstand material which would be removed once construction was completed. No retaining walls will be required for the temporary construction workforce car park.

Earthworks will be minimal and limited to clearing grass and placing a pad which seals the surface. This means the car park surface will essentially follow the natural contours of the land. Some areas on the northern side of the ridge are steep, the car park will utilise areas with flatter grades.

Features such as curb stops and safety fencing will be used to provide a safe and secure car park for workers and appropriate drainage and sediment controls and measurers would be included in accordance with Condition 21 (o) – Erosion and Sediment Control Plan.

The revisions to access arrangements for the temporary construction workforce car park mitigate the potential adverse impacts to park users. The use of a small percentage of the park area for a temporary car park is not expected to reduce the usability of the park, particularly when talking into account the ancillary works to maintain the public's amenity, such as construction of a new, more conveniently located toilet block and relocation of the barbeque facilities (which are currently adjacent to the proposed car parking area). With the location of the carpark at the northern side of the park, there still remains a buffer to the construction carpark and the Changed Project has moved tunnel and road construction activities further north away from residences on the southern side of Anzac Park.

4.3.9. Soils and Contaminated Land

Issues raised in the submissions relating to soils and land contamination included:

- *that construction of the car park would disturb the potentially contaminated subsoils exposing these soils to erosion and potential pollution of the Anzac Park wetland area, noting that there have been no studies to assess the potential impacts from soils including erosion risk, settlement risk, rehabilitation potential acid sulphate soils, contaminated land and construction spoil.*
- *that there is potential for imported contaminated fill to be used for the proposed Anzac Park workforce parking.*
- *that Anzac Park is identified on the contaminated land register and as a result the Brisbane City Council Subdivision and Development Guidelines (Infrastructure Elements, chapter 8 Parks) states that areas of the park listed on the EPA Environmental Management Register or Contaminated Land Register, should be appropriately remediated in accordance with the approved Landscape Management and* Siteworks *Plan and/or and approved EPA Site Management Plan, to meet EPA and Council requirements.*

A geotechnical / contaminated land assessment would be conducted prior to the construction of any car parking. The would include assessment of potential acid sulfate soils, erosion risk, presence of contamination and allow for appropriate action to be taken to mitigate any environmental impacts.

4.4. Provision of information as regards proposed temporary construction workforce car park at Anzac Park

Issues raised in the submissions relating to provision of information including concerns that a *lack of information was provided by the proponent with regards to proposed workforce parking at Anzac Park, and as a result did not constitute a proper application for the purposes of section 35B of the State Development and Public Works Organisation Act.*

With the removal of permanent road works from within Anzac Park, the Changed Project proposes a construction car park for approximately 200 vehicles within Anzac Park.

The Environmental Impact Statement (EIS) and Supplementary Report described the existing environment of Anzac Park and potential impacts to Anzac Park as a result of the proposed permanent construction works for the Reference Design. The Coordinator-General assessed the EIS and Supplementary Report for his evaluation report, and imposed conditions for the mitigation and management of potential effects of the project, including on Anzac Park.

The Changed Project not only removes permanent works from Anzac Park, but also reduces the area of Anzac Park that will be required for the construction phase of the project. As described in the Application for Project Change Report, the impacts on Anzac Park as a result of the NLRT Project are therefore predicted to be greatly reduced compared to the Reference Design evaluated by the Coordinator-General.

As stated in the Application for Project Change Report, the construction car park will be a temporary measure, with the area to be reinstated.

The existing conditions imposed by the Coordinator-General already respond to potential impacts of the temporary construction car park, including conditions for:

- a construction traffic EMP sub-plan (condition 16) to be approved by BCC and the Department of Transport and Main Roads
- night lighting (condition 18(f))
- air quality (condition 20)
- stormwater quality (condition 21)
- noise (condition 22)
- hazard and risk, including construction traffic (condition 25).

The existing construction management conditions imposed by the Coordinator-General provide sufficient controls to manage the potential impacts of the proposed temporary construction car park. Further noise controls were recommended to manage the potential for noise from vehicles use the car park.

It is considered that the Application for Project Change Report, in addition to the existing assessment that has been carried out by the Coordinator-General in relation to Anzac Park and the existing conditions that will apply to the temporary construction car park, contain sufficient information for the Coordinator-General to assess the likely impacts of the temporary construction car park in Anzac Park in accordance with the *State Development and Public Works Organisation Act 1971*.

5. Tollroad Control Centre

The location of the Tollroad Control Centre (TCC) proposed in the Application for Project Change has been reviewed and a new location will be identified for the TCC, in response to community concerns which have been raised during the assessment of the Application for Project Change. Council is no longer considering locating the TCC at Mt Coot-tha Road opposite the Botanic Gardens and is considering alternative locations for the TCC at the current Park and Ride area on Mt Coot-tha Road, Toowong or adjacent to the Clem7 Tollroad Control Centre at Bowen Hills.

With the change in the proposed location of the TCC away from this location, the Botanic Gardens overflow car park area would now be used for temporary construction workforce parking, as originally outlined in the Reference Design and approved by the Coordinator-General. A second temporary construction workforce car park is also proposed for Anzac Park as discussed in Section 4 above.

6. Changes to Project Design – Eastern Connection

6.1. Changes to Project Design – Eastern Connection

Issues and concerns raised in submissions included that as the ICB eastbound drops from four to three lanes there will be congestion and safety problems, and it was suggested that the ICB must be upgraded from six to eight lanes to adequately manage the traffic flow.

With respect to the ICB eastbound lane configuration, it is anticipated that a change in pavement line marking to implement priority in the eastbound merge area that better reflects the balance of expected traffic demands would improve operation and better achieve the desired level of service outcomes. This will be further investigated during the detailed design of the Changed Project.

6.2. Changes to Project Delivery – Eastern Connection

6.3. Effects of Project Changes – Eastern Connection

6.3.1. Traffic and Transport

6.3.1.1. Pedestrian Access

Issues and concerns raised in submissions included that the existing footbridge over the ICB is not user-friendly, and the existing structure could extended as part of the Project.

The existing pedestrian bridge that enables south-north access across the ICB will be extended from its current position so that pedestrians using it will continue to have access to the realigned path.

A new concrete footpath would also be provided to link in with the newly aligned footpath/cycleway running north towards the golf course. This will be delineated from the INB and construction work zone to improve user safety with respect to the construction worksite. The installation of the extended pedestrian bridge will enable construction activities to be completed without impeding on pedestrians and will maintain foot access to the school tennis courts.

6.3.1.2. Parking

Issues and concerns raised in submissions included that construction workers may be tempted to park in Normanby Terrace. It was suggested that the street is in close proximity and workforce parking will place an additional burden for parking in this street during the construction phase. It was also suggested that the Normanby Terrace is made 'Residents and Visitors parking only' and a footpath be installed along the southern side of the street to allow safe pedestrian access.

The arrangements of construction workforce car parking have not changed from the Reference Design, which provided an off-street car parking area at the eastern end of Gilchirst Avenue. As noted in the Application for Project Change construction personnel would be directed to use either public transport or the dedicated parking areas in order to avoid and manage the effects of parking in local streets.

6.3.1.3. Safety

Issues and concerns raised in submissions included that the bikeway along the back boundary of the southern side of Normanby Terrace will impact on the security of houses.

During construction, the existing footpath/bikeway along the back boundary of the southern side of Normanby Terrace would be realigned maintain pedestrian and cyclist connectivity around the TBM extraction site. The temporary alignment would be closer to the rear boundary of the properties on the southern side of Normanby Terrace. The bikeway would be reinstated to the existing alignment following

the completion of construction works. As part of the construction management measures, a temporary noise barrier would be constructed adjacent to the rear property boundary of the properties for the extent of the realigned footpath/bikeway. The temporary noise barriers would also serve a dual purpose and improve security by preventing ready access through the back of these properties.

6.3.2. Air Quality and Greenhouse Gases

Issues and concerns raised in submissions included that:

- *There may be increased dust impacts on air quality and health as a result of the eastern portal and ventilation outlet moving closer to residences at Normanby Terrace.*
- *The ventilation outlet would not be fitted with filtration equipment with suggestions that provisions be made to retrofit the outlet.*
- *The ventilation outlet should be buried to reduce visual impact for neighbouring properties*
- *Appropriate measures needed to be developed in partnership with the Eastern Community Liaison Group to be taken to minimise the health impacts of interior dust.*

It was suggested that research indicates that the health impacts of ultra fine particulates can range from respiratory problems to acute myocardial infarction (heart attack), with particular reference to a study of Sydney's M5 East tunnel showing up to 1000 times higher ultra fine particulates than urban ambient conditions, exceeding predicted levels in the Reference and Changed Designs.

The location of the ventilation outlet has not changed from the Reference Design. As noted in the Application for Project Change the air quality design and operational features are generally unchanged compared to the Reference Design and the current Coordinator-General conditions remain appropriate.

6.3.3. Noise and Vibration

Issues and concerns raised in submissions included that:

- *there may be increased health impacts from noise and vibration due to the eastern portal being moved closer to residents of Normanby Terrace and Kelvin Grove.*
- *the existing noise barriers along the ICB are ineffective.*
- *there was vague information about noise mitigation measures to be applied at the eastern portal, with a statement that 1m barriers will be ineffective at reducing noise.*

A number of suggestions were made including that eastern portal should be moved 400m towards Herston to reduce the impacts on Normanby Terrace, that NLRT project uses functional aesthetic engineering solutions to mitigate existing noise issues from the ICB, that noise mitigations systems should be installed prior to construction and that noise monitoring data should be made available to the public during the operational phase of the tunnel.

Detailed 3D noise modelling of the new portal/transition areas will form part of the detailed design phase of the project. Noise mitigation would be designed and implemented to ensure compliance with the Coordinator-General's Conditions. Preliminary modelling of the new portal/transition areas has been undertaken which recommend a number of mitigation measures to ensure compliance with the Coordinator-General's Conditions. These mitigations measures were reported in the Application for Project Change as follows:

- increasing the height of existing noise barriers adjacent the Normanby Terrace residences by an additional 1m; and

- by installing two new noise barriers – one up to 6m high to the west of Victoria Park Road and one to the east of Victoria Park Road adjacent to the Brisbane Grammar School sports fields – north of the ICB.

The concept design for the proposed noise barriers for the eastern connection are shown in **Figure 6-1** and **Figure 6-2**. These concepts are subject to detailed design, which would be informed by the detailed 3D noise modelling.

Any further measures required to achieve compliance with the Coordinator-General's road traffic noise conditions will be identified in the detailed design.

The Coordinator-General's conditions addressing noise and vibration are presented in Schedule 3 conditions 22 and 31. These conditions remain relevant to the Changed Project. The Changed Project and the conditions respond to the issues raised in submissions to the EIS in relation to amenity impacts associated with the construction worksites.

A Noise and Vibration EMP Sub-Plan for construction would be developed and implemented in accordance with Condition 22. This would include monitoring requirements for the construction period. Condition 31 requires that monitoring is undertaken as part of the Operation Noise EMP Sub-Plan with the reporting made publicly available.

6.3.4. Planning and Land Use

Issues and concerns raised in submissions included the perceived negative impact the eastern portal will have on property prices.

Property values are influenced by a broad range of factors, including access to transport and other urban infrastructure and acceptable amenity. Amenity impacts will be mitigated consistent with the existing Coordinator-General's Conditions. No evidence is available to suggest that property prices will be adversely impacted as a consequence of the Changed Project.

6.3.5. Urban Design and Visual Environment

6.3.5.1. Light spill

Issues and concerns raised in submissions included that the closer proximity of the Eastern Portal to Normanby Terrace will create a greater impact of light spill on some residences, and that while reassurances were made that monitoring and adequate minimisation will take place, some houses may require special treatment depending on their location.

As part of the detailed design for the project, lighting would be designed to comply with AS 4282-1997: Control of the Obtrusive Effects of Outdoor Lighting. This is a requirement of the existing Coordinator-General Condition 24(f) for the Project and remains relevant to the Changed Project.

6.3.5.2. Residential amenity

Issues and concerns raised in submissions included that loss of amenity for the residents should be ameliorated through street improvements at Normanby Terrace and Victoria Park Road.

The existing Coordinator-General Condition 15 is relevant to this issue which requires an urban design and landscape EMP Sub-Plan to be developed in accordance with the draft EMP in Appendix D of the Supplementary Report. The objectives and performance criteria set out in this draft EMP remain relevant and appropriate to the Changed Project. The objectives included to *deliver positive impacts for the local community (including connectivity, character integration and landscape amenity) from the Project Works and associated infrastructure through the application of high quality urban and landscape design*

measures. The details and extent of landscape and design treatments would be finalised as part of the detailed design of the Project.

6.3.6. Social Environment

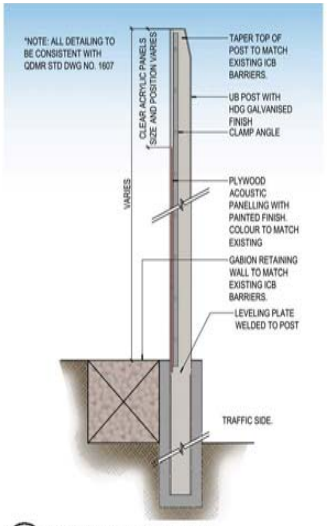
The Coordinator-General has requested further information on how the safety of students using the Grammar School oval and tennis courts adjacent to the ICB will be addressed and how minimising disruption of sporting activities will be addressed.

The existing pedestrian bridge that enables south-north access across the ICB will be extended from its current position, maintaining pedestrian access to the realigned shared path on the northern side of the ICB. The bridge extension will be constructed offline, delivered to site and connected to the existing bridge and realigned path. During construction, temporary overnight closure would be required to connect the extension, otherwise continued access would be maintained. From the end of the new extension, a concrete footpath will be in place to link with the realigned shared path running north towards the golf course (see **Figure 6-3**). This path would be separated from the construction worksite, ensuring user safety when passing the site. Once the extension and path are installed, all construction activities will be completed without impeding pedestrians, and will maintain foot access to the school tennis courts.

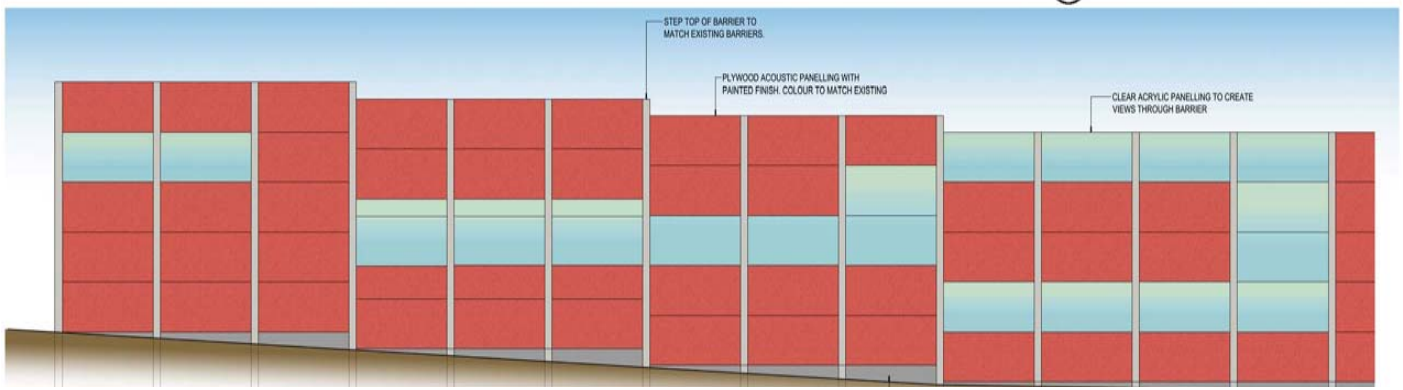
Construction Traffic Management Plans will be developed and approved in consultation with the school., and will include arrangements for pedestrians and cyclists. The above works are anticipated to occur over a 4 week period from early May 2011.

As noted in the Application for Project Change, the Changed Project requires a slightly larger area of the school playing fields than the Reference Design. The eastern worksite also includes part of the playing fields, which is described in the Application for Project Change. Following completion of construction works, the remainder of the playing fields will be reinstated in accordance with the Coordinator-General's conditions Schedule 3 condition 18 (o), which stipulates "following completion of permanent construction works the construction areas must be rehabilitated as quickly as reasonable and practicable". The details of the landscape and design treatments would be finalised as part of the detailed design of the Project.

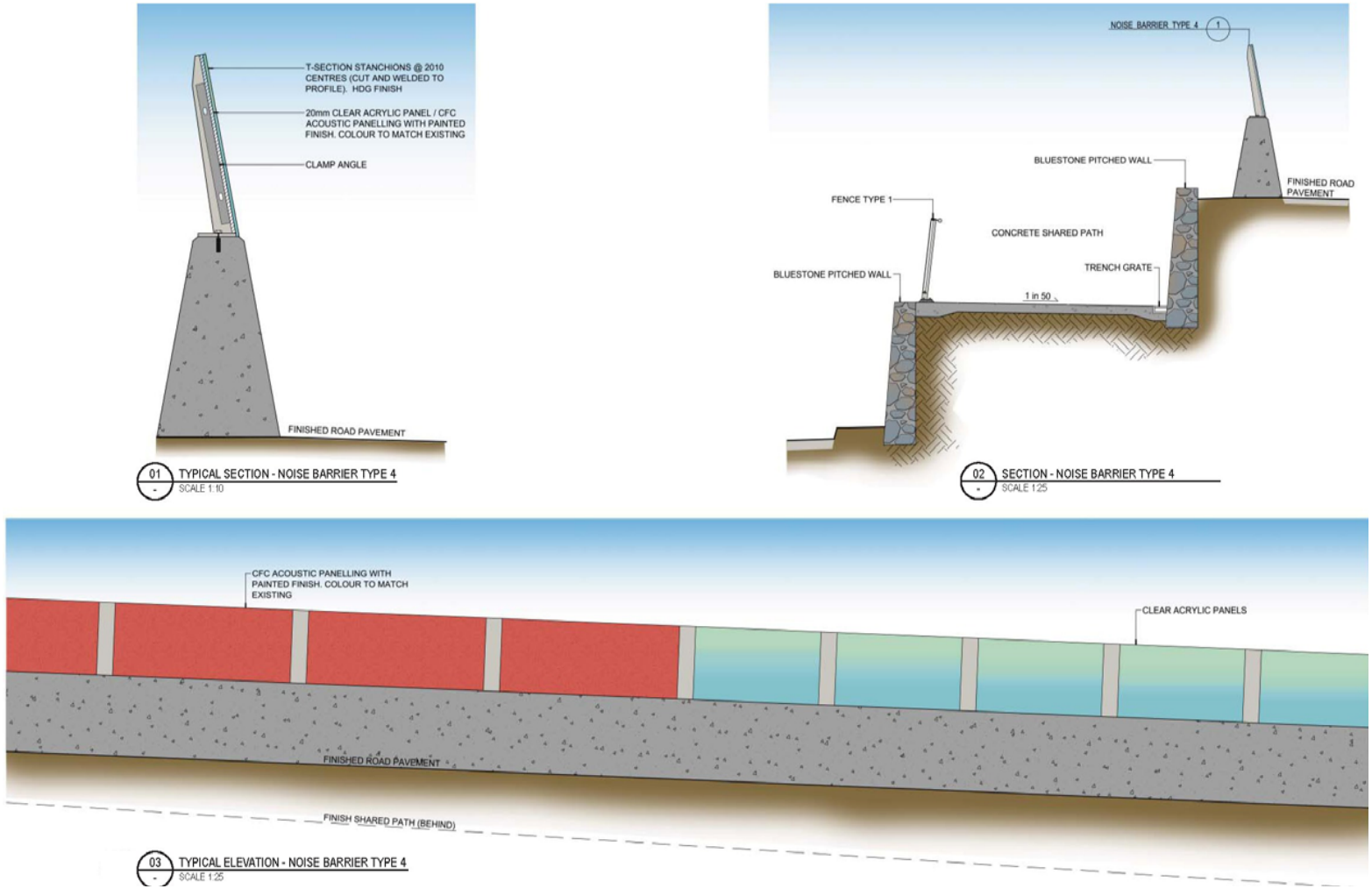
01 NOISE BARRIER KEYPLAN
SCALE 1:1000



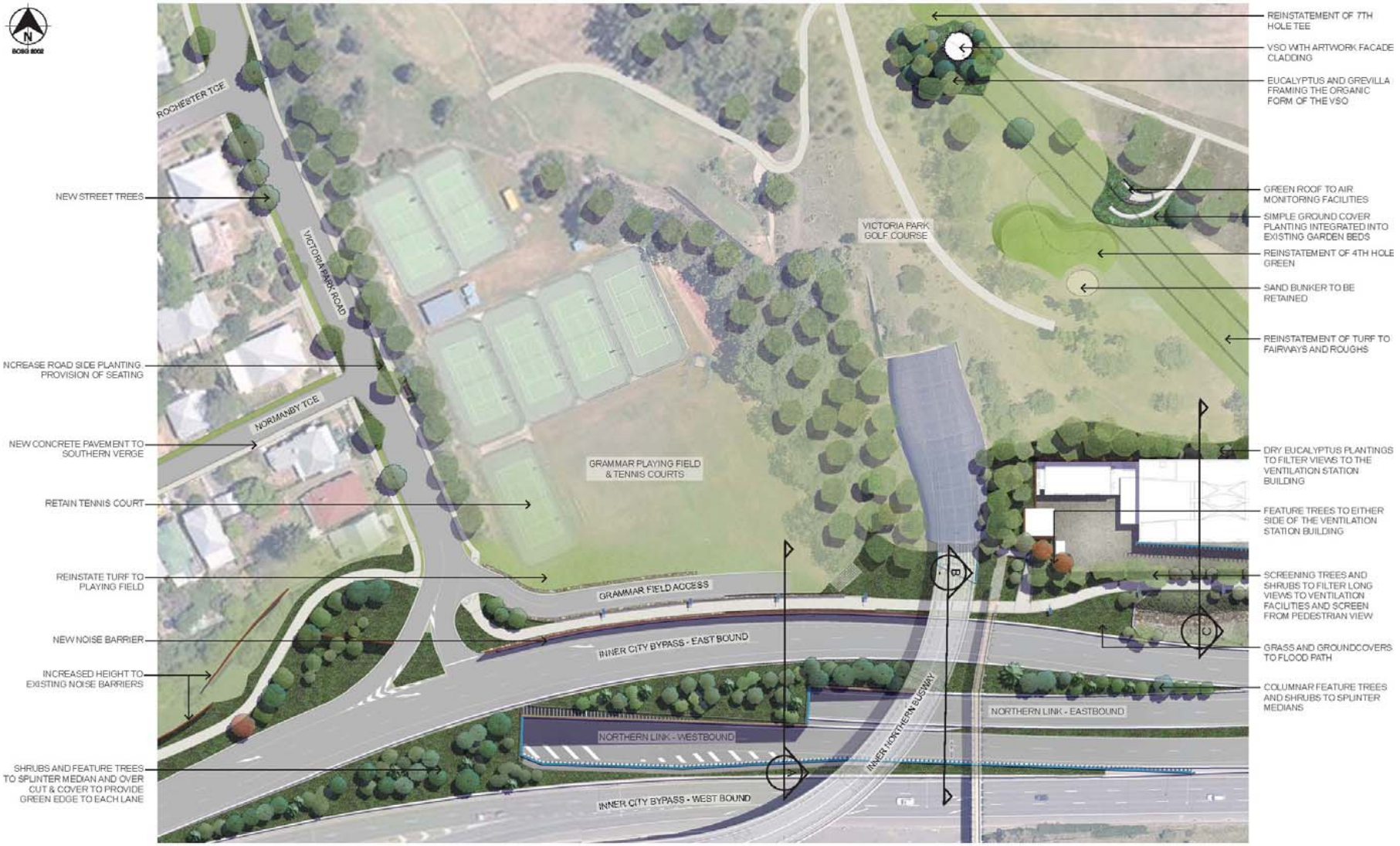
02 NOISE BARRIER TYPE 1 SECTION
SCALE 1:50



- **Figure 6-1 Eastern Connection Noise Barriers Concept Design 1**



- **Figure 6-2 Eastern Connection Noise Barrier Concept Design 2**



- **Figure 6-3 Eastern Connection Urban Design and Landscape Illustration**

7. Recommendations and Conclusions

The existing conditions as varied by the conditions proposed in the Application for Project Change remain relevant and appropriate.

8. Errata

Correction to Request for Project Change report

The average number of trucks required for the Changed Project (TBM spoil) for the western truck haulage is **less** than reported in Table 2-7 of the Application for Project Change. The value shown for 'Average No. of Truck Loads per day' of 50 should be 32 and the value shown for 'Average No. of truck loads per hour' for Truck Haulage West of 5 should be 3. The revised table is included below. It is noted that this correction will result in a reduction of potential impacts as the reported potential truck loads is lower.

Table 2-7: Total spoil quantity estimates and haulage requirements

Worksites and Construction Areas	Conveyor to Mt Coot-tha Quarry (Bank m3)		Truck Haulage West (Bank m3)			Truck Haulage East (Bank m3)		Total Estimate Spoil Quantity and Truck Haulage Movements (Bank m3)	
	Ref Design (TBM)	Changed Project (TBM)	Ref Design	Changed Project	Changed Project (TBM)	Ref Design	Changed Project	Ref Design	Changed Project
Western and Centenary Motorway	973,000[1]	932,000[1]	265,000	151,300[2]	151,700[3]	NIL	NIL	1,238,000	1,235,000
Eastern and ICB	NIL	NIL	NIL	NIL	NIL	25,000	40,500	25,000	40,500
Total Spoil	**973,000**	**932,000[1]**	**265,000**	**303,000**		**25,000**	**40,500[4]**	**1,263,000**	**1,275,500**
Truck Haulage Movements	NIL	NIL	20,400	11,600[2]	11,700[3]	2000	3100	**22,400**	**26,400**
Duration of Works (months)	14	12	14	12	14	23	15		
Average No of Truck Loads per day	NIL	NIL	58	37	32	3	8		
Average No of truck loads per hour[5]	NIL	NIL	6	4	3	0.3	0.8		

Table Notes

1. Spoil from the TBMs via conveyor to the Western Worksite Spoil Handling Shed and then by conveyor into the quarry.
2. Lower due to Changed Project not having the deep transition cuts and extensive cut and cover of the Reference Design
3. Excess spoil from the driven TBM tunnel construction would be handled within the acoustic shed at the western end of the site and hauled out along the approved routes between the hours stipulated in the Coordinator-General's conditions Schedule 3 condition 16 and between 6.30am Monday to 6:30 pm Saturday with allowances to avoid peak hours.
4. Includes spoil estimates associated with the buried vent outlet duct and the partial burial of the ventilation station not accounted for in the Reference Design.
5. Normal truck haulage (Surface Works) is based on standard construction hours (6.30am to 6.30 pm Monday to Saturday).