Road Construction Pre-cast Facility

Review of environmental factors

December 2016

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Roads and Maritime Services

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Review of Environmental Factors

December 2016

Prepared by Jacobs Group (Australia) Pty Ltd

Executive summary

The proposal

Roads and Maritime Services (Roads and Maritime) propose to establish and operate a pre-cast facility (the proposal) to support the construction of road projects, including the New M5. The facility would be established and operated on George Booth Drive, Buchanan, in the Cessnock local government area (LGA).

The subject site for the proposal area is an area of land that previously operated as a pre-cast facility in 2010 to support the construction of the Hunter Expressway project. Minimal site construction works would be required to reinstate the pre-cast facility as the site is already established. Site construction works for the proposal would include:

- Re-instating fencing around the proposal area
- Installing site office facilities
- Inspection of existing facilities including waste water treatment facilities (septic tanks, sand filtration system and sediment basin) and completing any necessary repairs.

The proposal area would be approximately four hectares in size and wholly contained within the previously disturbed and established Hunter Expressway pre-cast facility. The proposal area would accommodate the following facilities:

- Demountable site compound office
- A pre-cast yard, including existing shed for construction of pre-cast units and storage laydown area
- Waste water treatment facilities consisting of septic tanks, sand filtration system and sediment basin
- On-site parking for up to 60 vehicles.

When the facility is no longer required to support construction of road projects, the proposal area would be returned to its existing state. Rehabilitation of the proposal area to its state prior to the Hunter Expressway Project is not part of the scope of works.

Need for the proposal

The proposal would support the construction of road projects in NSW, in particular the New M5 project that is being delivered as part the wider WestConnex program of works. The New M5 would link to the upgraded King Georges Road Interchange on the existing M5 East Motorway at Beverly Hills and run via twin tunnel to St Peters. The New M5 tunnels would more than double the capacity of the M5 East corridor, improving travel times and reliability for the 100, 000 motorists which use the route every day. The proposal would support the construction of the New M5 by providing a facility to produce pre-cast components for the New M5 that is otherwise not available. The proposed facility would also be available to supply pre-cast elements for other road projects currently being constructed, including the Pacific Highway Upgrade. Future road projects that are in development phase, such as the M4-M5 WestConnex could also be provided with pre-cast elements should they be approved.

Proposal objectives

The primary objective of the proposal is support the construction of NSW road projects, in particular the New M5 project through the fabrication of pre-cast components.

Options considered

The following options were considered against the proposal objectives and strategic need:

- Option 1 - This option would involve establishing the pre-cast facility in Sydney within the New M5 construction footprint. This option has been ruled out as there is no available space within the approved construction compounds or other land within the New M5 alignment
- Option 2 - This option would involve establishing the pre-cast facility in Sydney, outside of the New M5 construction footprint. This option has been ruled out as there are no pre-existing facilities available, the establishment of a new facility in Sydney is considered cost prohibitive, and unlikely to be approved and constructed to meet the New M5 construction program
- Option 3 - This option would involve sub-contracting work to an existing approved pre-cast facility. This option has not been pursued as no currently operational pre-fabrication sub-contractors have existing bridge component experience, as it has always been carried out in-house by bridge construction contractors. The lack of experience is considered an unacceptable project risk
- Option 4 - This option would involve establishing the pre-cast facility at an existing off site facility. The proposal area contains the only pre-existing facility available in NSW.

Option 4 is considered the preferred option, as it would meet the proposal objectives and the strategic need with no substantial environmental impacts.

Statutory and planning framework

The State Environmental Planning Policy (Infrastructure) 2007 (ISEPP) aims to facilitate the effective delivery of infrastructure across New South Wales. Clause 94 of the ISEPP permits development on any land for the purpose of a road or road infrastructure facilities to be carried out by or on behalf of a public authority without consent. Development permissible without consent is required to be assessed under Part 5 of the *Environmental Planning and Assessment Act 1979* and development consent from council is not required.

The proposal would support the construction of road projects in NSW, specifically the New M5 project being delivered on behalf of Roads and Maritime.

An approval from the Commonwealth Minister for the Environment under the *Environment Protection Conservation Act 1999* (EPBC Act) is not required as the proposal would not constitute a significant impact on matters of national environmental significance or on the environment of Commonwealth land.

This review of environmental factors (REF) fulfils the requirements of Section 111 of the EP&A Act and has been prepared in accordance with Clause 228 of the *Environmental Planning and Assessment Regulation 2000* and EPBC Act.

Community and stakeholder consultation

Consultation has been carried out with the affected landowner, Ausgrid and Coal and Allied. A lease of the subject site will be entered into with the landowner prior to the proposal commencing. Coal and Allied has confirmed that a Right of Way for access will be created allowing continued access through their land to the subject site. Ausgrid has confirmed that there is no constraint on transferring pre-cast components through Ausgrid easements subject to high load permits being issued. Consultation with the Aboriginal community and government agencies was not carried out for the proposal. The proposal does not trigger consultation requirements under ISEPP.

Environmental impacts

Traffic and transport

The proposal would generate about 50 light vehicle trips and 21 heavy vehicle movements during peak traffic periods. The increases in vehicle movements as a result of the proposal are not expected to impact on the road safety and operation of the adjacent road network, given the existing and forecast low traffic volumes, low crash history in the area and good operational performance of the intersection at the access road.

Noise and vibration

The proposal is likely to exceed the operational noise criteria at three residences during operation of the proposal. Environmental safeguards and mitigation measures have been outlined in the REF to reduce noise impacts as far as possible.

Visual impacts

The construction and operation of the proposal would result in temporary moderate-low visual impacts to the three identified sensitive receivers (residential dwellings) identified. As the proposal area is already constructed only the visibility of the New M5 construction associated use would be visible. This would include the presence of construction plant and equipment, construction vehicles movements and light spill from any potential night work and construction vehicles.

Visual impacts as a result of the proposal would be temporary and limited to the duration of construction of the New M5. At the completion of New M5 construction works all plant and equipment brought to the proposal area in relation to the New M5 construction would be removed and the proposal area returned to its existing state.

Justification and conclusion

The proposal is required to facilitate and support construction of road projects in NSW, in particular the New M5 project that is part of the wider WestConnex program of works. The proposal would support the construction of the New M5 by providing a facility to produce pre-cast components for the New M5 that is otherwise not available. In the absence of space within the approved New M5 construction footprint, alternative options have been assessed and were not considered viable. Other road construction projects that are approved or yet to be approved would have the potential to receive pre-cast elements from this facility. The proposed use of the existing pre-cast facility would have limited impacts on the environment and nearby receivers. It would also contribute to the local economy through increased customers for local business. Standard mitigation measures have been recommended to manage the impacts identified.

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1 Introduction

1.1 Proposal identification

1.1.1 The proposal

Roads and Maritime Services (Roads and Maritime) propose to establish and operate a pre-cast facility (the proposal) to support the construction of road projects, including the New M5. The facility would be established and operated on George Booth Drive, Buchanan, in the Cessnock local government area (LGA).

The subject site for the proposal area is an area of land that previously operated as a pre-cast facility in 2010 to support construction of the Hunter Expressway project. Minimal site construction works would be required to reinstate the pre-cast facility as the site is already established. Site construction works for the proposal would include:

- Re-instating fencing around the proposal area
- Installing site office facilities
- Inspection of existing facilities including waste water treatment facilities (septic tanks, sand filtration system and sediment basin) and completing any necessary repairs.

The proposal area would be approximately four hectares in size and wholly contained within the previously disturbed and established Hunter Expressway pre-cast facility. The proposal area would accommodate the following facilities:

- Demountable site compound office
- A pre-cast yard, including existing shed for construction of pre-cast units and storage laydown area
- Waste water treatment facilities consisting of septic tanks, sand filtration system and sediment basin
- On-site parking for up to 60 vehicles.

When the facility is no longer required to support construction of road projects, the proposal area would be returned to its existing state. Rehabilitation of the proposal area to its state prior to the Hunter Expressway Project is not part of the scope of works.

The location of the proposal is shown in **Figure 1-1** and the proposed layout of the facility is shown in **Figure 1-2**.

1.1.2 Timeframe and cost estimate

It is anticipated that the site would be used for a period of about three and a half years while the construction of the road projects in Sydney is underway. The cost of establishing the facility is expected to be about 15,000 dollars per month.

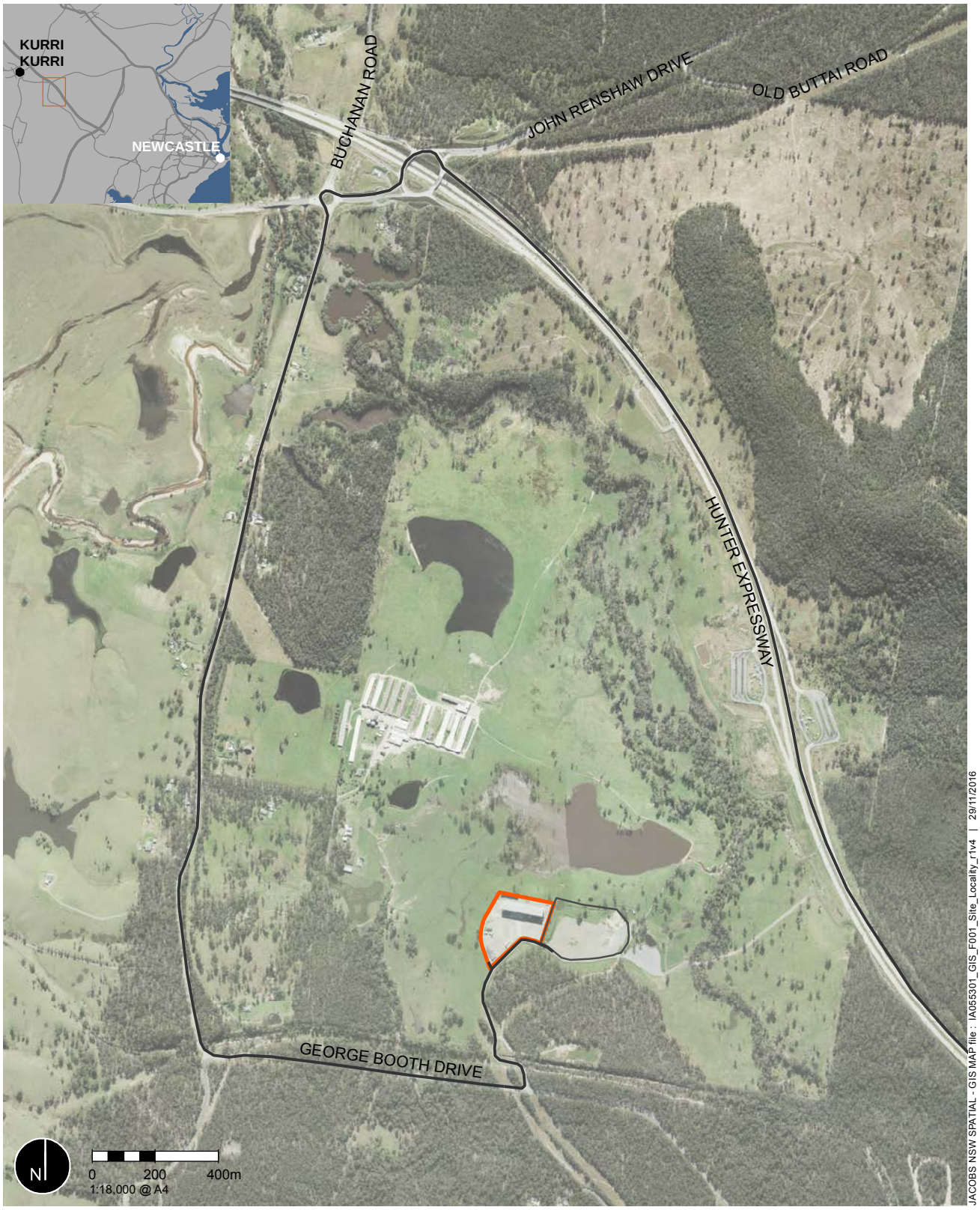


Figure 1-1 | Site locality

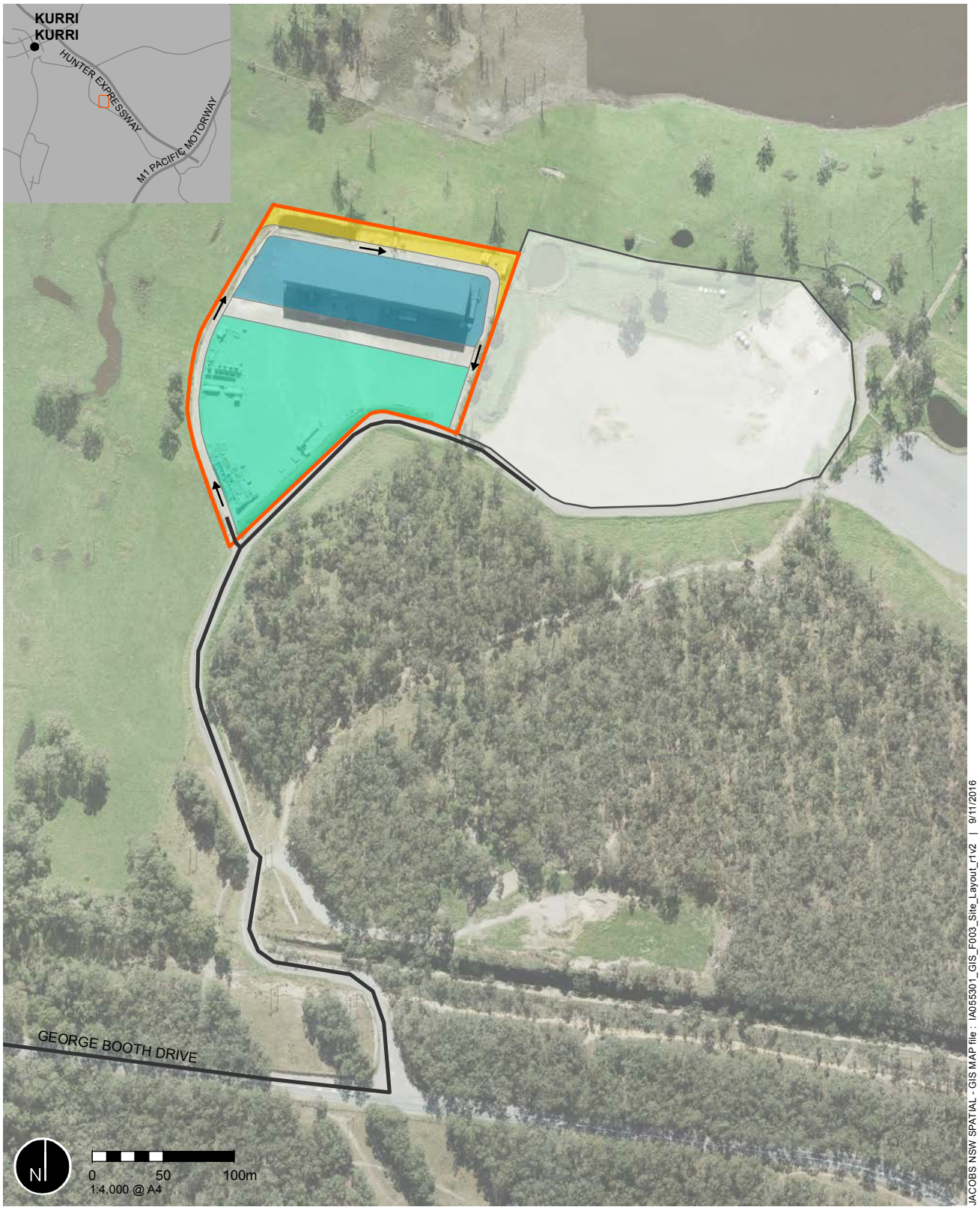


Figure 1-2 | Site layout plan

1.1.3 Terms used in this report

The following terms are used in this Review of Environmental Factors (REF):

- 'The proposal' refers to the construction (site re-establishment) and use of the pre-cast facility in association with construction of the New M5
- 'The proposal area' refers to the area that would be directly impacted by construction and use of the proposal. It includes the total construction and operational footprint and any other areas that would be temporarily disturbed. The proposal area is shown on **Figure 1-2.**
- 'The study area' encompasses the proposal area and the area that may be indirectly impacted by the proposal. This term refers to the area considered by the specialists studies, and may differ according to the environmental issue. Definitions of specialist study areas are provided in **Chapter 6**.

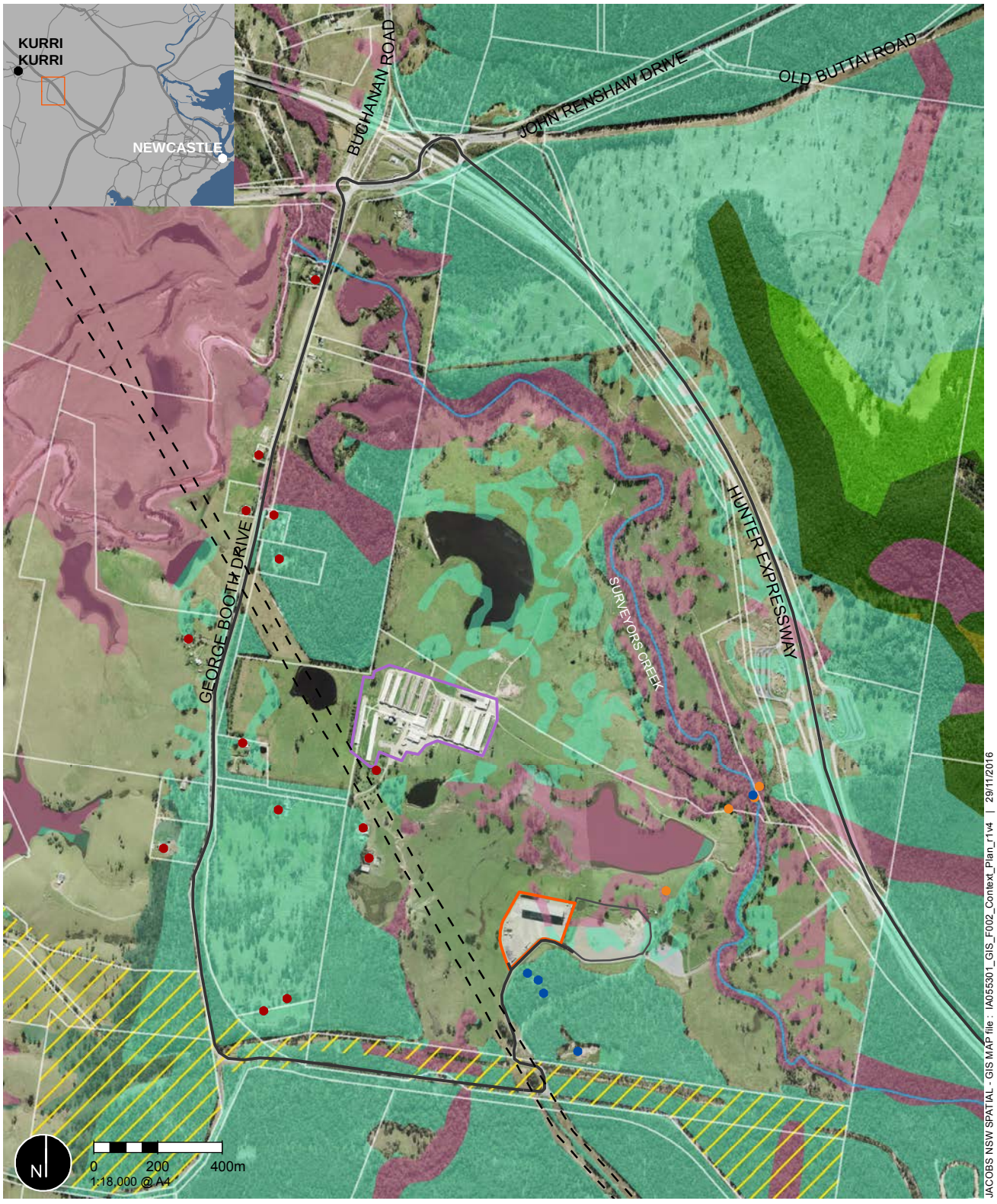
1.1.4 The locality

The proposal is located in suburb of Buchanan in the Cessnock LGA. The proposal is located on private rural property which is predominately used for agriculture including cattle grazing and poultry farming. The footprint of the proposal would be wholly contained within the area previously used as a pre-cast facility for the Hunter Expressway project.

The main land use features within the property where the proposal is located include:

- A relatively flat area of disturbed land with existing shed
- Three residential dwellings located towards the western property boundary (closest residential dwelling located about 530 metres west of the proposal)
- A poultry farm located towards the north western corner
- An Ausgrid electricity easement (comprising two 33 kilovolt power lines and one 11 kilovolt power line with a clearance of eight metres) which traverses through the property in a north westerly direction
- A large dam located towards the north eastern corner of the property.

Existing infrastructure in the property is described further in **Section 2.2**. Land uses adjacent to the property comprise a mix of agricultural grazing land located to the north and west, the Hunter Expressway corridor located to the east, the former Richmond Vale Railway corridor which runs parallel to the southern boundary of the property and undeveloped bushland owned by Coal and Allied Operations Pty Ltd (Coal and Allied) located adjacent to the southern property boundary. A site context plan is shown in **Figure 1-3**.



Site boundary
Additional storage area if required
Poultry farm
Traffic route to Hunter Expressway
Energy Australia easement
Residential property

Heritage

European heritage site
Indigenous heritage site
Richmond Vale Railway corridor

Hunter Expressway Alliance - Consistency Review Report (2010)
Cessnock LEP (2011)

Vegetation

Alluvial Tall Moist Forest
Coastal Foothills Spotted Gum - Ironbark Forest
Coastal Narrabeen Moist Forest
Coastal Plains Smooth-barked Apple Woodland
Hunter Lowland Redgum Forest
Lower Hunter Spotted Gum - Ironbark Forest

LHCCREMS (2009)

Figure 1-3 | Site context plan

1.2 Purpose of the report

This REF has been prepared by Jacobs on behalf of Roads and Maritime Journey Management Division. The purpose of the REF is to describe the proposal, to document the likely impacts of the proposal on the environment, and to detail protective measures to be implemented.

The REF has been prepared to address requirements under the following legislation:

- Part 5 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act).

For the purposes of these works, Roads and Maritime is the proponent and the determining authority under Part 5 of the EP&A Act.

The description of the proposed work and associated environmental impacts have been undertaken in the context of clause 228 of the *Environmental Planning and Assessment Regulation 2000*, the factors in *Is an EIS Required? Best Practice Guidelines for Part 5 of the Environmental Planning and Assessment Act 1979* (Is an EIS required? guidelines) (DUAP, 1995/1996), the *Threatened Species Conservation Act 1995* (TSC Act), the *Fisheries Management Act 1994* (FM Act), and the Australian Government's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

In doing so, the REF helps to fulfil the requirements of:

- Section 111 of the EP&A Act that Roads and Maritime examine and take into account to the fullest extent possible, all matters affecting or likely to affect the environment by reason of the activity.

The findings of the REF would be considered when assessing:

- Whether the proposal is likely to have a significant impact on the environment and therefore the necessity for an environmental impact statement to be prepared and approval to be sought from the Minister for Planning under Part 5.1 of the EP&A Act
- The significance of any impact on threatened species as defined by the TSC Act and/or FM Act, in section 5A of the EP&A Act and therefore the requirement for a Species Impact Statement
- The significance of any impact on nationally listed biodiversity matters under the EPBC Act, including whether there is a real possibility that the activity may threaten long-term survival of these matters, and whether offsets are required and able to be secured
- The potential for the proposal to significantly impact any other matters of national environmental significance or Commonwealth land and the need, subject to the EPBC Act strategic assessment approval, to make a referral to the Australian Government Department of the Environment and Energy for a decision by the Commonwealth Minister for the Environment on whether assessment and approval is required under the EPBC Act.

2 Need and options considered

2.1 Strategic need for the proposal

The proposal would support the construction of road projects in NSW, in particular the New M5 project that is part the wider WestConnex program of works. The WestConnex program of works aims to improve access and connectivity for the wider Sydney Metropolitan region. The New M5 will link to the upgraded King Georges Road Interchange on the existing M5 East Motorway at Beverly Hills and run via twin tunnel to St Peters. The New M5 tunnels will more than double the capacity of the M5 East corridor, improving travel times and reliability for the 100, 000 motorists which use this key route every day. The proposal would support the construction of the New M5 by providing a facility to produce pre-cast components for the New M5 that is otherwise not available. The proposed facility would also be available to supply pre-cast elements for other road projects currently being constructed, including the Pacific Highway Upgrade. The facility could also provide future road projects that are in development phase, such as the M4-M5 WestConnex with pre-cast elements should they be approved.

2.2 Existing infrastructure

The proposal is located on a site that was previously used as a pre-cast facility for the Hunter Expressway project. The site is established on flat hardstand material and has an existing pre-cast yard shed, waste water treatment facilities (septic tanks, sand filtration system and sediment basin) and surrounding fencing.

An Ausgrid electricity easement which comprises two 33 kilovolt power lines and one 11 kilovolt power line with a clearance of eight metres traverses through the property in a north westerly direction.

Access to the proposal would be provided from George Booth Drive and an existing access road. George Booth Drive is a classified main road. It extends in a north-south direction, linking suburbs from Edgeworth to Buchanan. The section of road near the proposal area has a posted speed limit of 80 kilometres per hour. The road has one westbound and one eastbound through lane. The section of road near the proposal area also has one westbound right turn slip lane and one eastbound left turn slip lane into the access road.

2.3 Proposal objectives and development criteria

2.3.1 Proposal objectives

The primary objective of the proposal is support the construction of road projects, in particular the New M5 project through the fabrication of pre-cast components.

2.4 Alternatives and options considered

2.4.1 Methodology for selection of preferred option

As part of the options analysis, each option was reviewed against the proposal objective outlined in **Section 2.3.1** and the strategic need, as discussed in **Section 2.1**. Factors considered in the options analysis include space constraints, cost and environmental impacts.

2.4.2 Identified options

Four options were considered and include:

- Option 1 - This option would involve establishing the pre-cast facility in Sydney within the New M5 construction footprint
- Option 2 - This option would involve establishing the pre-cast facility in Sydney, outside of the New M5 construction footprint

- Option 3 - This option would involve sub-contracting work out to an existing approved pre-cast facility
- Option 4 - This option would involve establishing the pre-cast facility at an existing off-site facility.

2.4.3 Analysis of options

Option 1: Establishing the pre-cast facility in Sydney within the New M5 construction footprint

Advantages of this option include:

- Close proximity to construction of the New M5
- Could be assessed and approved as part of the existing New M5 project.

Disadvantages of this option include:

- No space available within the construction footprint of the New M5
- Cumulative impacts from interaction with New M5 construction works.

Option 2: Establishing the pre-cast facility in Sydney, outside of the New M5 construction footprint

Advantages of this option include:

- Close proximity to construction of the New M5.

Disadvantages of this option include:

- No pre-existing facilities available
- Cost prohibitive in Sydney and unlikely to be approved and constructed to meet the New M5 construction program
- Environmental impacts (traffic and noise impacts) anticipated to be greater in Sydney due to dense population.

Option 3: Sub-contracting work out to an existing approved pre-cast facility

Advantages of this option include:

- Further approvals not required.

Disadvantages of this option include:

- Lack of sub-contractor with prior bridge component experience presents unacceptable project risk.

Option 4: Establishing the pre-cast facility at an existing off-project site.

Advantages of this option include:

- Site already established and can be operated by New M5 staff
- Only pre-existing facility available in NSW
- Operate with minimal environmental impacts.

Disadvantages of this option include:

- Distance from New M5 construction work
- Need for separate authorisation.

2.5 Preferred option

Option 4 is considered the preferred option, as it would meet the proposal objective and the strategic need with no substantial environmental impacts. Option 4 is discussed further in **Chapter 3**.

3 Description of the proposal

3.1 The proposal

Roads and Maritime propose to establish and operate a pre-cast facility (the proposal) to support construction of the road projects in particular the New M5. The facility would be established and operated on a site previously used as a pre-cast facility for the Hunter Expressway project, on George Booth Drive, Buchanan in the Cessnock LGA.

The proposal area operated as a pre-cast facility in 2010 as part of the Hunter Expressway project and has not been operating as a facility since this time. Minimal site construction works would be required for the proposal as the site is already established. Site construction works for the proposal include:

- Re-instating fencing around the proposal area
- Installing site office facilities
- Inspecting existing facilities including waste water treatment facilities (septic tanks, sand filtration system and sediment basin) and completing any necessary repairs.

The proposal area would be approximately four hectares in size and wholly contained within the previously disturbed and established Hunter Expressway pre-cast facility. The proposal area would accommodate the following facilities:

- Demountable site compound office
- A pre-cast yard, including existing shed for construction of pre-cast units and storage laydown area
- Waste water treatment facilities consisting of septic tanks, sand filtration system and sediment basin
- On-site parking for up to 60 vehicles.

The proposed layout of the proposal is provided in **Figure 1-2**. When the facility is no longer required to support construction of road projects, the proposal area would be returned to its existing state. Rehabilitation of the proposal area to its state prior to the Hunter Expressway Project does not form part of the scope of works.

3.2 Design

3.2.1 Design criteria

Design criteria are not applicable to the proposal as the proposal area is already established. The proposed site layout is shown in **Figure 1-2** and includes the following facilities:

- Demountable site compound office
- A pre-cast yard, including existing shed for construction of pre-cast units and storage laydown area
- Waste water treatment facilities consisting of septic tanks, sand filtration system and sediment basin
- On-site parking for up to 60 vehicles.

3.2.2 Engineering constraints

The proposal area previously operated as a pre-cast facility for the Hunter Expressway Project in 2010 and as such it is not anticipated there would be any major engineering constraints for the establishment and operation of the facility now. As described in **Section 2.2** an Ausgrid electricity easement comprising two 22 kilovolt power lines and one 11 kilovolt power line transverses through the property in a north westerly direction. The power lines have a clearance of eight

metres and are located above the access road. The clearance may pose some height restrictions to plant and equipment.

3.3 Construction activities

This section provides a summary of the indicative construction methodology, staging, work hours, plant and equipment that would be used for the proposal.

3.3.1 Work methodology

The construction stages and activities are summarised in **Table 3-1**.

Table 3-1 Proposed construction stages and key activities

Construction stage	Description of work and key activities
Stage 1: Site establishment	This stage would involve the following works: • Transporting equipment to site • Re-instating fencing around the proposal area • Installing demountable site compound office • Inspection of existing facilities including waste water treatment facilities (septic tanks, sand filtration system and sediment basin) and completing any necessary repairs.
Stage 2: Use of site	This stage would involve the production of the pre-cast concrete segments and would involve the following activities: • Receiving concrete deliveries from off-site Daracon concrete batching plant located at Cameron Park (12 deliveries per day) • Pouring about four pre-cast concrete segments per day • Despatching pre-cast concrete segments to Sydney (four to six deliveries per day).
Stage 3: Decommission site	This stage would involve decommissioning the site to its current state and would involve the following activities: • Removal of the site office, plant and equipment. Rehabilitation of the proposal area to a pre-disturbance state (prior to being used for the Hunter Expressway project) is not part of the scope of works.

3.3.2 Construction hours and duration

The proposal would be required for about three and a half years.

Construction and operation of the proposal would occur during standard construction hours including:

- Monday to Friday: 7am to 6pm
- Saturday: 8am to 1pm
- No work on Sundays or Public Holidays.

The dispatch of pre-cast components may be carried out outside standard construction hours to facilitate delivery through Sydney to the New M5 St Peters Interchange under low traffic volume conditions. Any other work undertaken outside standard construction hours would be in accordance with the Interim Construction Noise Guidelines (DECC, 2009) and the Construction Noise and Vibration guideline (Roads and Maritime, 2016).

3.3.3 Plant and equipment

Indicative plant and equipment required during construction and operation includes:

- Compressors
- Water blaster
- External form vibrators
- Poke vibrator- medium
- Weld sets
- Truck pump
- Hand tools
- Crane (35 tonne)
- Forklift (10 tonne)
- Light vehicles
- Workshop vehicle
- Scissor lift
- Generators
- Hydraulic pump
- Equipment for tables
- Straddle Carrier
- Gantry cranes
- Concrete delivery truck
- Rebar delivery truck
- Delivery trucks/vehicles

Additional equipment to that identified above may be needed. The requirement for additional equipment would be determined by the construction contractor to support the establishment or operation of the pre-cast facility.

3.3.4 Earthworks

Earthworks would not be required as the site is already established.

3.3.5 Source and quantity of materials

Concrete would be sourced from the Daracon concrete batching plant located on Cameron Park Drive in Cameron Park. The concrete batching plant is located about 7.5 kilometres south east of the proposal. About 12 concrete deliveries would be expected per day from the concrete batching plant. Water for the proposal would be sourced from authorised off-site sources, including recycled or re-used water.

3.4 Traffic management and access

This section outlines the likely changes to traffic during construction. Impacts on traffic would be minimised through the management measures outlined in **Section 6.1.4**.

Construction vehicles

The proposal would generate about 42 heavy vehicles movements and 100 light vehicles movements per day. Majority of heavy vehicles would be concrete trucks and delivery trucks while light vehicles would comprise of staff and labour vehicles. Traffic impacts are discussed further in **Section 6.1**.

Construction vehicle access and haulage routes

Access to the proposal area would be via an existing access road off George Booth Drive.

Concrete deliveries would be received from the Daracon concrete batching plant in Cameron Park. The haulage route to proposal area consists of Stenhouse Drive, Cameron Park Drive, Newcastle Link Road, Hunter Expressway, John Renshaw Drive, George Booth Drive.

The pre-cast concrete segments would be delivered to the New M5 St Peters compound site on Campbell Street. The haulage route would be in accordance with the construction traffic management plan for the proposal and is summarised below and shown in **Figure 3-1**:

- George Booth Drive, John Renshaw Drive, Hunter Expressway, Pacific Motorway, M1, Pennant Hills Road, M2, M7, M5, King Georges Road, Stoney Creek Road, Forest Road, Princes Highway, Canal Road, Burrows Road, Campbell Road.

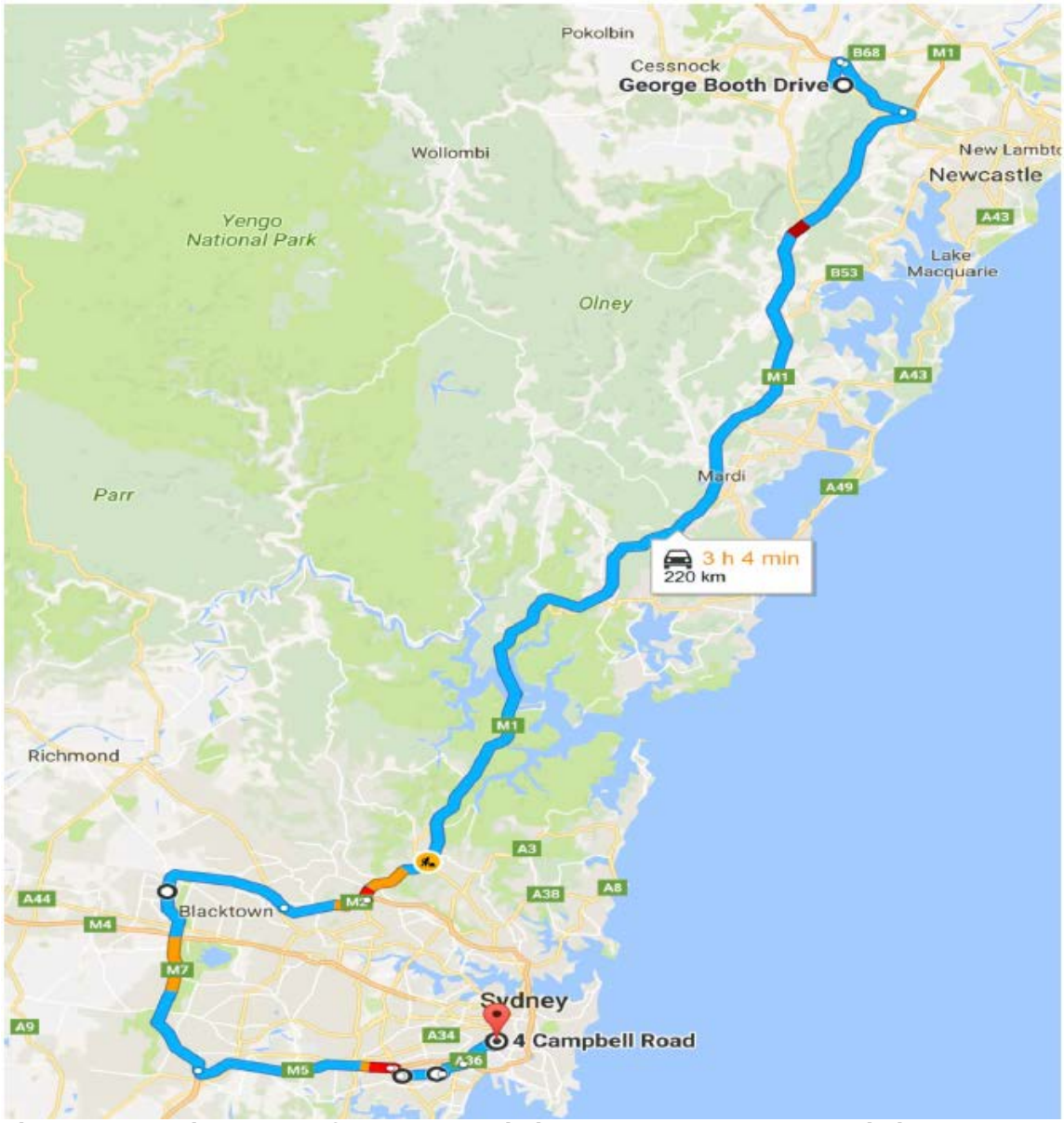


Figure 3-1 Haulage route from proposal site to St Peters compound site
Source: CDS JV Traffic Management Plan

Traffic management, control and signage

The following measures would be implemented to minimise impact during deliveries:

- Deliveries of pre-cast components to Sydney would be staged and carried out outside standard construction hours to minimise traffic impacts
- Traffic management measures would be used so that traffic flow is maintained in affected haulage routes. These measures would be documented in a traffic management plan (TMP) that would be developed in accordance with Roads and Maritime's Traffic Control at Works Sites Manual (RTA, 2010) and Specification G10 – Control of Traffic. Roads and Maritime would review the TMP before it is implemented.

Road and lane closures

No lane closures have been anticipated as a result of the proposal.

Impacts on parking

Up to 60 private light vehicles would access the site daily as part of the proposal. The proposal would provide a dedicated parking area for staff within the proposal area as shown in **Figure 1-2**.

3.5 Ancillary facilities

No ancillary facilities would be required as part of the proposal.

3.6 Property

3.6.1 Property ownership

The proposal is located on a rural property owned by a private land owner. Land adjacent to the southern boundary of the property is owned by Coal and Allied Operations Pty Ltd (Coal and Allied). The electricity easement which traverses through the property in a north-westerly direction is owned by Ausgrid.

3.6.2 Property acquisition

The proposal would not require land acquisition. A lease agreement would be entered into with the landowner for the duration of use of the site and include appropriate end of use provisions that exclude the removal of existing infrastructure from the site.

4 Statutory and planning framework

4.1 Environmental Planning and Assessment Act 1979

4.1.1 State Environmental Planning Policies

State Environmental Planning Policy (Infrastructure) 2007

State Environmental Planning Policy (Infrastructure) 2007 (ISEPP) aims to facilitate the effective delivery of infrastructure across the State.

Clause 94 of ISEPP permits development on any land for the purpose of a road or road infrastructure facilities to be carried out by or on behalf of a public authority without consent. Development permissible without consent is required to be assessed under Part 5 of the *Environmental Planning and Assessment Act 1979* and development consent from council is not required.

The proposal would support the construction of road projects in NSW, specifically the New M5 project being delivered on behalf of Roads and Maritime.

The proposal is not located on land reserved under the *National Parks and Wildlife Act 1974* and does not affect land or development regulated by State Environmental Planning Policy No. 14 - Coastal Wetlands, State Environmental Planning Policy No. 26 - Littoral Rainforests, State Environmental Planning Policy (State and Regional Development) 2011 or State Environmental Planning Policy (Major Development) 2005.

Part 2 of the ISEPP contains provisions for public authorities to consult with local councils and other public authorities prior to the commencement of certain types of development. Consultation, including consultation as required by ISEPP (where applicable), is discussed in **Chapter 5** of this REF.

4.1.2 Local Environmental Plans

Cessnock Local Environmental Plan 2011

The proposal is located within the Cessnock local government area (LGA). The principal relevant local environmental planning instrument under the EP&A Act is the Cessnock Local Environmental Plan 2011 (Cessnock LEP).

The proposal area is zoned RU2 Rural Landscape under the Cessnock LEP. The proposal is classified as development for the purpose of 'industries' and therefore is prohibited in this zone under the Cessnock LEP. However, the proposal would be permissible without consent from Cessnock City Council, in accordance with Clause 94 of the ISEPP (refer to **Section 4.1.1**).

Table 4-1 lists the objectives of this zone and their consistency with the proposal.

Table 4-1 Local environmental plan zones affected by the proposal

Zone	Objectives	Consistency of the proposal with the objectives
RU2- Rural Landscape	• To encourage sustainable primary industry production by maintaining and enhancing the natural resource base	The site has been previously established and its recommissioning and use provides an additional income stream to the rural land owner. The proposal does not reduce the natural resource base.

Zone	Objectives	Consistency of the proposal with the objectives
	• To maintain the rural landscape character of the land	The site has been previously established and its recommissioning and use does not reduce rural landscape character in the medium or long term.
	• To provide for a range of compatible land uses, including extensive agriculture	The use of the site is considered compatible with the surrounding uses. The site is not expected to reduce the landowners ability to continue to use the site for productive agricultural purposes.
	• To enable other forms of development that are associated with rural activity and require an isolated location or support tourism and recreation	The proposal is similar in scale to other intensive agricultural facilities in the area. While not associated with rural activities the temporary use of the facility does not prevent other forms of development.
	• To ensure that the type and intensity of development is appropriate in relation to the rural capability and suitability of the land, the preservation of the agricultural, mineral and extractive production potential of the land, the rural environment (including scenic resources) and the costs of providing services and amenities.	The intensity of use of the site will be managed such that no significant impacts eventuate.
	• To maintain and enhance the scenic character of the land.	The site has been previously established and its recommissioning and use does not reduce scenic character in the medium or long term.
	• To ensure that development does not create unreasonable or uneconomic demands for the provision or extension of services.	The proposal is consistent with this objective as it is not anticipated to create unreasonable or uneconomic demands for the provision or extension of services.
	• To minimise the visual impact of vegetation clearing in order to be consistent with the rural character of the locality.	The proposal is consistent with this objective as it will not require any vegetation removal.
	• To minimise disturbance to the landscape from development through clearing, earthworks, access roads and construction of buildings.	The proposal is consistent with this objective as it will not require new clearing, earthworks, roads or construction of buildings.

Zone	Objectives	Consistency of the proposal with the objectives
	• To ensure development does not intrude into the skyline when viewed from a road or other public place.	The proposal is consistent with this objective as it will not intrude into the skyline.

Note: Consent as described in this table is not required from Cessnock City Council, in accordance with Clause 94 of the ISEPP (refer to **Section 4.1.1**)

4.2 Other relevant NSW legislation

4.2.1 Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations Act 1997* (POEO Act) aims to protect, restore and enhance the quality of the environment, to reduce risk to human health and provide information to the public about environmental protection and pollution. The POEO Act is administered by the Environment Protection Authority and provides for the regulation and authorisation of discharges to the environment through issuing of an environment protection licence (EPL) for scheduled developments and activities, as listed on Schedule 1 of the POEO Act.

The scheduled activities set out in Schedule 1 that are most relevant to the proposal include:

- Concrete works (cl 13).

The proposal does not have capacity to produce more than 30,000 tonnes per year of concrete products and as such an EPL is not required.

4.2.2 Land Acquisition (Just Terms Compensation) Act 1991

The proposal would not require land acquisition. A lease agreement would be entered into with the landowner for the duration of use of the site and include appropriate end of use provisions that exclude the removal of existing infrastructure from the site.

4.2.3 Water Management Act 2000

The *Water Management Act 2000* (WM Act) was introduced to provide a comprehensive singular piece of legislation to effectively manage and regulate access, and use of, the State's water resources. Chapter 3 Part 3 of the WM Act requires that approval be granted for works that are classified as "controlled activities" within waterfront land defined as 40 metres from the bank of any river, lake, estuary or coastal waters of the state. (Lake includes a wetland, a lagoon, a saltmarsh and any collection of still water, whether perennial or intermittent and whether natural or artificial).

Clause 38 or the *Water Management (General) Regulation 2011* provides that a public authority is exempt from Section 91E (1) of the WM Act in relation to all controlled activities that it carries out in, on or under waterfront land. As such a controlled activity approval is not required for the proposed activity.

Section 91A of the WM Act provides that a person*:*

(a) who uses water from a water source to which this Part applies, and

(b) who does not hold a water use approval for that use,

is guilty of an offence.

The WM Act defines a water source as the whole or any part of one or more rivers, lakes or estuaries, or one or more places where water occurs naturally on or below the surface of the ground and includes the coastal waters of the State. It is not currently proposed to extract water

for use from any natural water source. Should this intent change an application for a water use approval would be undertaken separately from the REF process.

The project does not involve any ground penetration and as such consideration was not given to the aquifer interference aspects of the WM Act.

4.3 Commonwealth legislation

4.3.1 Environment Protection and Biodiversity Conservation Act 1999

Under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) a referral is required to the Australian Government for proposed actions that have the potential to significantly impact on matters of national environmental significance or the environment of Commonwealth land. These are considered in **Appendix A** and **Chapter 6** of the REF.

A referral is not required for proposed road activities that may affect nationally listed threatened species, populations, endangered ecological communities and migratory species. This is because requirements for considering impacts to these biodiversity matters are the subject of a strategic assessment approval granted under the EPBC Act by the Australian Government in September 2015.

Potential impacts to these biodiversity matters are also considered as part of **Chapter 6** of the REF and **Appendix A**.

Findings – matters of national environmental significance (other than biodiversity matters)

The assessment of the proposals impact on matters of national environmental significance and the environment of Commonwealth land found that it would be unlikely to be a significant impact on relevant matters of national environmental significance or on Commonwealth land. Accordingly, the proposal has not been referred to the Australian Government Department of the Environment and Energy under the EPBC Act.

Findings – nationally listed biodiversity matters

The assessment of the proposals impact on nationally listed threatened species, populations, endangered ecological communities and migratory species found that it would be unlikely to be a significant impact on relevant matters of national environmental significance. **Chapter 6** of the REF describes the safeguards and management measures to be applied.

4.4 Confirmation of statutory position

The proposal is categorised as development for the purpose of a road infrastructure facility and is being carried out on behalf of a public authority. Under clause 94 of the ISEPP the proposal is permissible without consent. The proposal is not State significant infrastructure or State significant development. The proposal can be assessed under Part 5 of the EP&A Act.

Roads and Maritime is the determining authority for the proposal. This REF fulfils Roads and Maritime's obligation under clause 111 of the EP&A Act to examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the activity.

Additional permits and approvals are required for this proposal in addition to the Part 5 determination and are detailed in **Section 7.3**.

5 Consultation

5.1 Community consultation and engagement

No community consultation has been undertaken in relation to the proposal. Consultation has been undertaken with the affected landowner. A lease agreement would be entered into with the land-owner for the duration of use of the site and include appropriate end of use provisions that exclude the removal of existing infrastructure from the Hunter Expressway Project from the proposal area.

5.2 Aboriginal community involvement

No consultation with the Aboriginal community has been undertaken in relation to the current proposal. Prior to the site being established and used as a pre-cast facility for the Hunter Expressway project in 2010, consultation with the following Aboriginal stakeholder groups was undertaken:

- Barkuma Neighbourhood Centre (BNC)
- Black Creek Aboriginal Corporation (BCAC)
- Lower Wonnarua Tribal Consultancy Pty Ltd (LWTC)
- Mindaribba Local Aboriginal Land Council (MLALC)
- Wonnarua Nation Aboriginal Corporation (WNAC).

Aboriginal stakeholder groups were consulted via an Aboriginal Focus Group, as part of the ongoing consultation process for the Hunter Expressway Project.

Given that the current proposal involves the establishment and operation of a pre-cast facility wholly within the site previously used for the Hunter Expressway Project and that it was considered that there would be no impacts to any Aboriginal cultural heritage areas or archaeological sites, consultation with the Aboriginal community was not considered necessary.

5.3 ISEPP consultation

Clause 13 of the ISEPP requires consultation with Cessnock City Council for development that would impact council related infrastructure or services. The proposal would not impact on council related infrastructure or services therefore Roads and Maritime is not required to carry out formal consultation with Cessnock City Council under this clause.

Clause 14 of the ISEPP also requires consultation with Council for a development that would have an impact that is not minor or inconsequential on a local heritage item (other than a local heritage item that is also a State heritage item). Heritage items in proximity to the proposal area are discussed in **Section 6.3**. The proposal would not impact on a local heritage item therefore Roads and Maritime is not required to carry out formal consultation with Cessnock City Council under this clause.

Clause 15 of the ISEPP states that a public authority must not carry out a development on flood-liable land that would change flood patterns other than to a minor extent, unless the authority has given written notice of the intention to carry out the development to the relevant council. The proposal is not located on flood liable land therefore Roads and Maritime is not required to carry out formal consultation with Cessnock City Council under this clause.

Clause 16 of the ISEPP states that a consent authority must not carry out specific types of development without giving written notice to the specified authority and taking their responses into consideration. No part of the proposal would be located on land reserved under the *National Parks and Wildlife Act 1974* (NPW Act), next to a declared marine park, declared aquatic reserve or foreshore area. Further, the proposal would not involve development over navigable waters or for the purposes of an educational establishment, health services facility, correction centre, group

home or for residential purposes. Therefore, Roads and Maritime is not required to carry out formal consultation with any Government agency under this clause.

5.4 Government agency and stakeholder involvement

Cessnock Council has been consulted in relation to the proposal. Council were supportive of the proposal on the basis that it would contribute to the local economy through increased customers for local businesses. Formal consultation was not undertaken.

Ausgrid has been consulted in relation to pre-cast deliveries and clearance requirements to the powerline that spans the access road. A representative from Ausgrid confirmed by email dated 17 November 2016 that Ausgrid would allow transport of 4.6m high (transport height) concrete sections through their easement or under their road crossing mains from Buchanan to WestConnex Project at St Peters. Ausgrid further noted that a normal High Load Permit would be required to be submitted to Ausgrid and approved, prior to each load movement between locations.

Coal and Allied has been consulted in relation to use of the access road to the facility that passes through their land. A representative of Coal and Allied confirmed by email on 22 November 2016 that the Coal and Allied land is in the process of being transferred to National Parks and Wildlife. As part of that process, a Right of Way will be created prior to the registration of the transfer of ownership.

5.5 Ongoing or future consultation

As the project proceeds, ongoing consultation will be undertaken with the surrounding neighbours and affected land owners including Ausgrid and Coal and Allied.

6 Environmental assessment

This section of the REF provides a detailed description of the potential environmental impacts associated with the construction and operation of the proposal. All aspects of the environment potentially impacted by the proposal are considered. This includes consideration of:

- Potential impacts on matters of national environmental significance under the EPBC Act
- The factors specified in the guidelines Is an EIS required? (DUAP 1995/1996) as required under clause 228(1) of the *Environmental Planning and Assessment Regulation 2000* and the *Roads and Related Facilities EIS Guideline (DUAP 1996)*. The factors specified in clause 228(2) of the *Environmental Planning and Assessment Regulation 2000* are also considered in **Appendix A**.

Site specific safeguards and management measures are provided to mitigate the identified potential impacts.

6.1 Traffic and transport

A Traffic and Transport Assessment (Jacobs, 2016) was prepared for the proposal and is provided in **Appendix C**. A summary of the assessment is provided in this section.

6.1.1 Methodology

Peak hour intersection counts were carried out on George Booth Drive at its intersection with the access road on 25 October 2016. Intersection analysis using SIDRA Intersection software (ver 6.1) was carried out using the intersection counts to determine potential traffic impacts at the intersection during morning (AM) and evening (PM) peak hour during operation of the facility.

6.1.2 Existing environment

Road network

The proposal area is situated to the east of the intersection of George Booth Drive and Richmond Vale Road and west of Hunter Expressway. These roads provide connections to the wider road network. Key roads in the study area include:

- George Booth Drive (MR527) - a two-lane two-way rural road that connects John Renshaw Drive (and then the Hunter Expressway) to the north with the Pacific Highway (M1) on south-east. George Booth Drive has a posted speed limit of 80 kilometres per hour except on a short section of road near John Renshaw Drive which has a posted speed limit of 60 kilometres per hour. The priority intersection ('Give way') at George Booth Drive allows turning movements from all directions
- John Renshaw Drive (MR 588) - a two-lane rural regional road which connects Maitland Street at Kurri Kurri with the New England Highway to the east at Tarro. John Renshaw Drive has a posted speed limit of 90 kilometres per hour in rural areas and 60 kilometres per hour in the town centres. John Renshaw Drive has major intersections with Hunter Expressway, New England Highway and the M1 Pacific Motorway
- Hunter Expressway - is a 40 kilometre long, four-lane freeway which was opened in 2014. This freeway links the M1 Motorway (Pacific Highway) near Seahampton and the New England Highway, west of Branxton. This provides an east-west connection between Newcastle and the Lower Hunter region. The access route to the proposal area from Hunter Expressway is provided via a roundabout intersection at John Renshaw Drive. The opening of Hunter Expressway has resulted in a substantial reduction of traffic on George Booth Drive.

Existing traffic volumes and network performance

Table 6-1 summarises the traffic volumes for George Booth Drive at its intersection with the access road.

Table 6-1 Existing traffic volumes and heavy vehicle flows on George Booth Drive (Jacobs, 2016)

Road	Location	Direction	Morning peak hour (veh/hr)	Evening peak hour (veh/hr)	Heavy vehicles as % of morning peak hour volume	Heavy vehicles as % of evening peak hour volume
George Booth Drive	Intersection of George Booth Drive and access road	Westbound	68	105	1%	6%
		Eastbound	106	83	2%	7%

Intersection performance

Table 6-2 summarises the performance of the intersection at George Booth Drive and the access road. Intersection performance can be measured using the level of service (LoS) scale, which grades performance from A (good) to F (poor). A LoS of A applies when traffic is delayed for an average of less than 14 seconds while a LoS of F applies when traffic is delayed for more than 70 seconds.

The intersection performance is based on the worst performing movement. The intersection at George Booth Drive and the access road currently operates at LoS A in both morning and evening peak periods.

Table 6-2 Existing intersection level of service (Jacobs, 2016)

Period	Approach	Total vehicles	Average delay (seconds)	LoS	95% back of queue (metres)
AM peak- 2016 existing	George Booth Drive- east leg	73	0.10	A	0.0
	Access road- north leg	2	5.3	A	0.0
	George Booth Drive- west leg	113	3.2	A	0.0
	Worst movement	**1**	**7.2**	**A**	**0.0**
PM peak- 2016 existing	George Booth Drive- east leg	112	0.1	A	0.0
	Access road- north leg	2	5.3	A	0.0
	George Booth Drive- west leg	87	3.2	A	0.0
	Worst movement	**-**	**7.8**	A	**0.0**

LoS: level of service

Crash history

A review of the crash history for George Booth Drive between Richmond Vale Road and Echidna Drive for the period 2011 to 2015 identified the following:

- There were a total of 13 crashes (an average of 2.6 per year)
- Of these none were fatal but ten were injury crashes
- 69 per cent of these crashes were non intersection related and majority were off-carriageway type crashes
- Two of these crashes were the result of vehicles hitting an animal.

There were no intersection related crashes at the intersection of George Booth Drive and the access road.

Heavy vehicle routes

Roads in the vicinity of proposal area, such as George Booth Drive, John Renshaw Drive and Hunter Expressway are the approved routes for 26 metre-long B-Doubles and 4.6 metre-high vehicles.

Road infrastructure and services

Public transport

There are few public transport services that operate near the proposal area on George Booth Drive. Route 2521- Buchanan to Metford Public School, is a school bus that is operated by Hunter Valley Buses, which runs in the north-south direction on George Booth Drive. Route 160 and 163 (Rover Coaches) operate from Cessnock via Kurri Kurri and John Renshaw Drive, but do not provide direct connections to the proposal area.

Pedestrian and cyclist facilities

There are no cycling and walking facilities in the vicinity of the proposal area due to its rural nature. However, John Renshaw Drive is identified as a proposed on-road cycleway route on the Cessnock Council Cycle network map.

6.1.3 Potential impacts

Traffic volumes

As discussed in **Section 3.4**, the proposal would generate about 42 heavy vehicle movements and 100 light vehicle movements per day. The majority of heavy vehicles would be concrete trucks and delivery trucks while light vehicles would comprise of staff and labour vehicles.

The traffic and transport assessment is based on 21 heavy vehicles and 50 light vehicles movements occurring during peak periods. Given the existing low traffic volumes of heavy vehicles in the peak periods, increases in vehicle movements as a result of the proposal are not anticipated to impact on the operation of the surrounding road network.

Intersection performance

Table 6-3 summarises the LoS for the intersection of George Booth Drive and the access road for the current and proposal scenarios. Traffic modelling indicates that the intersection will continue to operate at LoS A in both the morning and evening peak hours with very minor delays.

Table 6-3 Intersection level of service for current and proposal scenarios (Jacobs, 2016)

Period	Scenario	Total vehicles	Average delay (seconds)	LoS	95% back of queue (metres)
AM Peak	2016 existing (worst movement)	1	7.2	A	0.0
	Proposed (worst movement)	23	7.1	A	0.7
PM Peak-2016 existing	2016 existing (worst movement)	-	7.8	A	0.0
	Proposed (worst movement)	5	7.7	A	1.7

LoS: level of service

Public and active transport

There are no bus routes along east-west direction of George Booth Drive. There are no formal footpaths and cycle facilities are provided along George Booth Drive and within the study area. As such, the construction works would have minimal impact on public and active transport facilities.

Parking

On-site parking for up to 60 vehicles would be provided on site, resulting in no impact to the provision of on-street car parking.

6.1.4 Safeguards and management measures

Table 6-4 identifies safeguards and management measures that will be implemented to address potential impacts of the proposal on traffic and transport.

Table 6-4 Safeguards and management measures for traffic and transport

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Traffic and transport	A Traffic Management Plan (TMP) will be prepared and implemented as part of the PEMP. The TMP will be prepared in accordance with the Roads and Maritime *Traffic Control at Work Sites Manual* (RTA, 2010) and *QA Specification G10 Control of Traffic* (Roads and Maritime, 2008). The TMP will include: • Confirmation of haulage routes • Measures to maintain access to local roads and properties • Site specific traffic control measures (including signage) to manage and regulate traffic movement • Measures to maintain pedestrian and cyclist access • Requirements and methods to	Contractor	Detailed design / Pre-construction	Core standard safeguard TT1 Section 4.8 of QA *G36 Environment Protection*

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
	consult and inform the local community of impacts on the local road network • Access to construction sites including entry and exit locations and measures to prevent construction vehicles queuing on public roads • A response plan for any construction traffic incident • Consideration of other developments that may be under construction to minimise traffic conflict and congestion that may occur due to the cumulative increase in construction vehicle traffic • Monitoring, review and amendment mechanisms.			

6.2 Noise and vibration

A Noise Impact Statement (Renzo Tonin & Associates, 2016) was prepared for the proposal and is provided in **Appendix D**. A summary of the assessment is provided in this section.

6.2.1 Methodology

The NSW EPA Industrial Noise Policy (INP, 2000) outlines two methods for determining the background noise level of an area, including 'B1- Long-term background noise method' and 'B2-Short-term background noise method'. The long-term background noise method was used for this assessment.

Long-term unattended noise monitoring was conducted at the closest residence to the proposal (1416 George Booth Drive, Buchanan) over about one week to determine existing ambient and background noise levels.

6.2.2 Existing environment

The proposal area is located on privately owned rural property. There are 10 residential noise sensitive receivers within about one kilometre of the proposal area. In addition, two industrial noise sensitive receivers including the Henholme and Orica Kurri Technical Centre are located within one kilometre of the proposal area. Noise sensitive receivers are identified in Appendix B of the Noise Impact Statement.

All heavy vehicles would access the proposal from George Booth Drive via the Hunter Expressway to the north. George Booth Drive is considered a sub-arterial road and the Hunter Expressway is a major arterial road.

6.2.3 Criteria

Operational noise criteria

The most stringent criteria of the intrusive and amenity noise criteria for residential (rural) receivers under the INP was adopted for the proposal. Accordingly. the following operational noise criteria have been adopted for the proposal:

- Residential (rural) 39 + 5 = 44 dB(A) (intrusiveness)
- Industrial 70 dB(A)

Operational noise traffic criteria

George Booth Drive is considered a sub-arterial road and therefore the following road traffic noise criterion was adopted for the proposal in accordance with the NSW Road Noise Policy:

- Freeway/arterial/sub-arterial roads 60 dB(A) $_{LAeq,\ (15\ hour)}$

According to the NSW Road Noise Policy any increase in the total traffic noise level should be limited to 2 dB(A) above existing conditions. Traffic noise impacts were not considered on the Hunter Expressway as it is a major arterial road.

6.2.4 Potential impacts

Operational noise assessment

The Cadna-A computer noise model was used to model and assess airborne noise impacts from the proposal. It also considered the noise sources, receiver locations and height, topographical features, sound power levels of plant and equipment and possible noise mitigation measures. **Table 6-5** below summarises the predicted noise levels at surrounding receivers. Receivers where the noise criteria is exceeded are bolded in **Table 6-5** and shown highlighted in

Figure 6-1.

Table 6-5 Predicted noise level (Renzo Tonin & Associates, 2016)

Receiver ID	Address	Predicted noise level - dB(A), $LA_{eq(15min)}$	INP Noise criteria – dB(A)
R_01	1332 George Booth Drive, Buchanan	43	44
R_02	1395 George Booth Drive, Buchanan	33	44
R_03	1408 George Booth Drive, Buchanan	43	44
R_04	1413 George Booth Drive, Buchanan	34	44
R_05	**1/1416 George Booth Drive, Buchanan**	**49**	**44**
R_06	**3/1416 George Booth Drive, Buchanan**	**50**	**44**
R_07	**4/1416 George Booth Drive, Buchanan**	**46**	**44**

Receiver ID	Address	Predicted noise level - dB(A), $LA_{eq(15min)}$	INP Noise criteria – dB(A)
R_08	1424 George Booth Drive, Buchanan	36	44
R_09	1459 George Booth Drive, Buchanan	32	44
R_10	1490 George Booth Drive, Buchanan	31	44
C_01	1151 George Booth Drive, Buchanan	38	70
C_02	4/1416 George Booth Drive, Buchanan	48	70

Note: Bold text indicates an exceedance of the noise criteria

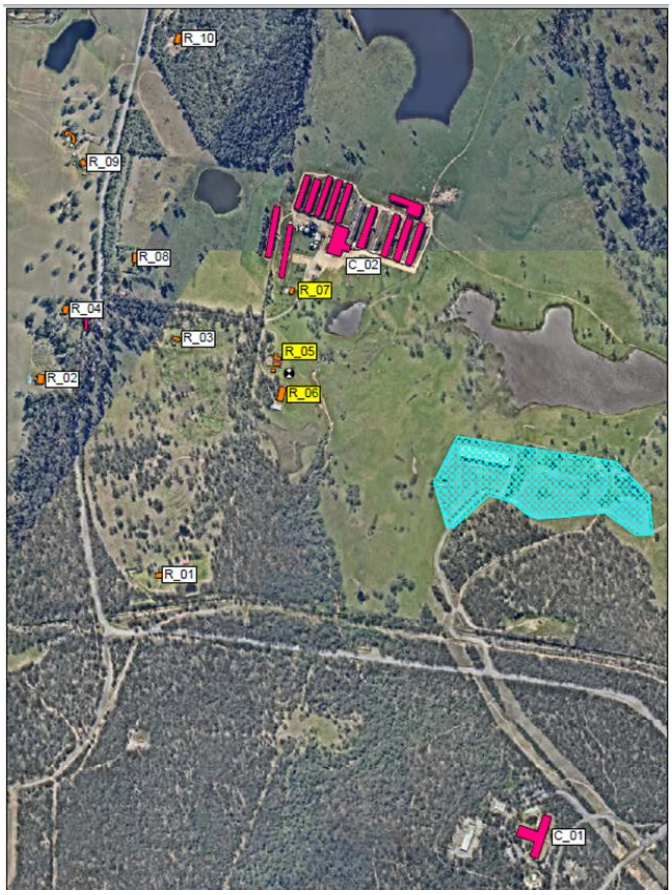


Figure 6-1 Receivers where noise criteria is exceeded highlighted in yellow
Source: Map adopted from Noise Impact Statement (Renzo Tonin & Associates, 2016)

Table 6-5 shows that minor exceedances of the operational noise criteria would occur at three residences during operation of the proposal (refer to

Figure 6-1). Because the residences where the exceedances would occur are owned by the owner of the land leased by the precast facility, it is unlikely that complaints would be received, however,

a recommendation to carry out attended noise monitoring has been made to verify noise levels during construction (refer to **Section 6.2.5**).

Traffic noise assessment

Additional traffic movements in the form of light vehicle movements, delivery vehicles, trucks removing finished segments and concrete trucks arriving at the site would result in additional traffic noise. An assessment of construction noise has found that the proposal would result in a noise increase of less than 2 dB(A) in overall day $L_{Aeq(15\ h)}$. The assessment found the proposal would have minimal impact on traffic noise generated to residences on George Booth Drive and would be beneath the traffic noise criteria identified in **Section 6.2.3**.

6.2.5 Safeguards and management measures

Table 6-6 identifies safeguards and management measures that will be implemented to address potential impacts of the proposal on traffic and transport.

Table 6-6 Safeguards and management measures for noise and vibration

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Noise impacts from proposal	The following at-source control measures are recommended to reduce potential noise impacts: • Noise control kits • Limit equipment in use • Timing of equipment in use • Limit activity duration • Use and siting of plant • Equipment selection • Non-tonal reversing alarms.	Contractor	Construction and Operation	Additional standard N1
Noise impacts from proposal	The following noise management measures are recommended for inclusion into the PEMP: • Site inductions and toolbox talks • Community consultation • Behavioural practices.	Contractor	Construction and Operation	Additional standard N2
Noise exceedances at receivers	Attended noise monitoring will be carried out to verify noise levels from the proposal at receiver C_02. Monitoring will be carried out in accordance with the procedures in Appendix F of the WestConnex Stage 2 Construction Noise and Vibration Management Plan.	Contractor	Construction and Operation	Additional standard N3

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Complaints	Noise complaints will be responded to and addressed in accordance with the WestConnex Stage 2 Construction Noise and Vibration Management Plan and the Construction Complaints Management System.	Contractor	Construction and Operation	Additional standard N4

6.3 Non-Aboriginal heritage

6.3.1 Methodology

A search of the following non-Aboriginal heritage registers was carried out in October 2016 to identify heritage places within and near the proposal. The following data registers and databases were searched:

- NSW State Heritage Register
- Cessnock Local Environmental Plan 2011
- Section 170 heritage and conservation registers
- National Heritage List
- Commonwealth Heritage List
- Register of National Estate (non-statutory).

The consistency assessment prepared for the HECC Site was also reviewed (Hunter Expressway Alliance, 2010) in October 2016.

6.3.2 Existing environment

Heritage items near the proposal area

There are no heritage items located in the proposal area. There is one listed heritage item near the proposal area (about 460 metres south) and four potential heritage items identified within the property boundary (Hunter Expressway Alliance, 2010). Heritage items include the Richmond Vale Railway, a derelict bridge on Surveyors Creek, a former quarry, former mine workings and pastoral infrastructure. These heritage items are described below and are presented in **Table 6-7** and shown in **Figure 1-3**.

Richmond Vale Railway

The former Richmond Vale Railway corridor is located about 460 metres south of the proposal area and adjacent to the southern property boundary. This item is listed on the Cessnock LEP as having local heritage significance. The Richmond Vale Railway was operational in this location between 1905 and 1967. All track work was removed from the rail corridor between 1972 and 1973. No rail infrastructure was identified within the corridor during the site investigation in 2010 (Umwelt, 2010).

Derelict bridge on Surveyors Creek

This item consists of the remains of a derelict bridge which is located about 690 metres north-east of the proposal area, towards the north eastern corner of the property. The bridge was constructed of rough conglomerate abutments that supported timber logs to form the deck which has since been removed. However the remains of the former track comprising bitumen gravels on a gravel road base is evident leading to the derelict bridge. The year of construction of the bridge is

unknown however is considered to be typical of a simple bridge constructed on a rural property in the Hunter Region.

Former quarry

This item is located about 380 metres south of the proposal area and has a history of excavation by the current land owner. This site was formerly used as the batching plant for the HECC Site and has since been rehabilitated.

Former mine workings

This item consists of an area of former mine workings located to the south of the proposal area within a large area of remnant vegetation. Items within the area include a shaft, back filled pits and machine and building footings. The closest item is located about 160 metres south of the proposal area.

Pastoral infrastructure

This item consists of dams and cattle yards located towards the north and north west of the proposal area respectively. The pastoral infrastructure forms part of the working rural property. The closest item is located about 180 metres north of the proposal area.

Table 6-7 Listed and potential heritage items near the proposal area

Item	Register listing(s) and	Significance	Relationship to proposal
Richmond Vale Railway	Cessnock LEP Item No. I214	Local	About 460 metres south
Derelict bridge on Surveyors Creek	Potential heritage item- Not a listed heritage item	Little or no heritage significance	About 690 metres north-east
Former quarry	Potential heritage item- Not a listed heritage item	Little or no heritage significance	About 380 metres south
Former mine workings	Potential heritage item- Not a listed heritage item	Little or no heritage significance	Closest item of the former mine workings is located about 160 metres south
Pastoral infrastructure	Potential heritage item- Not a listed heritage item	Little or no heritage significance	Closest item of pastoral infrastructure is located about 180 metres north

6.3.3 Potential impacts

The proposal would be contained to land previously disturbed for the establishment and operation of a pre-cast facility for the Hunter Expressway project and would not result in any ground disturbance. As such, there would be no potential for impacts on heritage items listed in **Table 6-7** or any unidentified non-Aboriginal heritage items.

6.3.4 Safeguards and management measures

Table 6-8 identifies safeguards and management measures that will be implemented to address potential impacts of the proposal on non-Aboriginal heritage.

Table 6-8 Safeguards and management measures for non-Aboriginal heritage

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Non-Aboriginal heritage	• The *Standard Management Procedure - Unexpected Heritage Items* (Roads and Maritime, 2015) will be followed in the event that any unexpected heritage items, archaeological remains or potential relics of Non-Aboriginal origin are encountered. • Work will only re-commence once the requirements of that Procedure have been satisfied.	Contractor	Construction and Operation	Core standard safeguard H1 Section 4.10 of QA *G36 Environment Protection*
Non-Aboriginal heritage	• Non-Aboriginal heritage awareness training will be provided for all contractors and personnel before the start of construction to provide an awareness of retained heritage items within the vicinity of the proposal and required management measures, to ensure understanding of the procedure required to be carried out in the event of discovery of non-Aboriginal heritage materials, features or deposits, or the discovery of human remains.	Contractor	Pre-construction	Additional safeguard H2

6.4 Visual impacts

6.4.1 Methodology

The proposals visual impacts were assessed in accordance with Roads and Maritime's Environmental Impact Assessment Practice Note EIA-N04 Guidelines for Landscape Character and Visual Impact Assessment (2013). Considering the scale of the proposal the assessment was limited to a visual impact assessment, undertaken in accordance with Section 6 of the guideline.

The proposals overall predicted level of visual impact was identified by considering the visual sensitivity of the proposal area and the magnitude of the proposed work.

Visual sensitivity and magnitude are broadly defined as follows:

- Sensitivity refers to the qualities of the area and how sensitive the existing area is to the proposed change
- Magnitude refers to the nature and scale of the proposal in relation to the existing area.

Using the impact assessment rating matrix presented in **Table 6-9**, an overall visual impact rating was identified for the proposal.

Table 6-9 Impact assessment rating matrix

		Magnitude			
		High	Moderate	Low	Negligible
Sensitivity	High	High	High-Moderate	Moderate	Negligible
	Moderate	High–Moderate	Moderate	Moderate–Low	Negligible
	Low	Moderate	Moderate–Low	Low	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

Source: Roads and Maritime, 2013

6.4.2 Existing environment

The proposal area is located on a privately owned rural property which is predominately characterised by sweeping agricultural pasture land used for cattle grazing and poultry farming. The agricultural pasture land is punctuated by small isolated stands of trees, a large farm dam located towards the north eastern property boundary and large patches of remnant vegetation located along Surveyors Creek and towards the southern property boundary. The rural landscape is interrupted by the existing infrastructure on site located in about the centre of the property, an electricity easement which traverses through the property in a north easterly direction and a poultry farm consisting of a number of large metal sheds located to the north western corner of the property. Three sensitive receivers (residential dwellings) are located within the property (refer to **Figure 1-3**). The closest residential dwelling is located about 530 metres west of the proposal.

Views of the proposal area from the three sensitive receivers are generally unscreened due to the overall lack of tall vegetation located towards the west of the proposal area. Views of the proposal area beyond the property boundary are limited by the extent of existing tall vegetation and the flat to slightly undulating topography of the surrounding area. Visibility of the property from George Booth Drive is also limited.

The sensitivity of the proposal area is considered to be low due to its previously disturbed nature and existing facilities. The existing visual environment of the proposal area is shown in **Figure 6-2** to **Figure 6-4**.

Figure 6-2 Proposal area showing existing shed

Figure 6-3 View of proposal area looking over location of proposed staff carpark

Figure 6-4 View from proposal area of residential receivers and poultry farm

6.4.3 Potential impacts

The operation of the proposal would result in temporary moderate-low visual impacts to the three identified sensitive receivers as a result of the following impacts:

- Associated operational activities
- Presence of construction plant and equipment
- Construction vehicles movements within proposal area
- Light spill from any potential night work and construction vehicles.

As outlined in **Section 6.4.2** the sensitivity of the proposal area is considered to be low due to it being previously disturbed by the Hunter Expressway pre-cast facility. However the magnitude of the proposal is considered to be moderate due above mentioned impacts. Therefore the overall impact on the three identified sensitive receivers within the property (includes landowner) would be moderate-low.

Visual impacts to road users as a result of construction vehicle movements along haulage routes would be low. The majority of the roads specified in the haulage routes are classified as main roads and therefore are generally of low sensitivity due to existing traffic volumes. The proposal would receive about 12 concrete deliveries from Daracon per day and generate four to six deliveries to St Peter per day. Considering the existing volumes of the main roads, additional vehicles generated as a result of the proposal would be of low magnitude.

Visual impacts as a result of the proposal would be temporary and limited to the duration of construction of the New M5. At the completion of New M5 construction works the site would be returned to its existing state.

6.4.4 Safeguards and management measures

Table 6-10 identifies safeguards and management measures that will be implemented to address potential visual impacts of the proposal.

Table 6-10 Safeguards and management measures for visual impacts

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Visual impact	To reduce the potential visual impact of construction activities: • Work sites will be left tidy at the end of each work day • Lighting for night-time work will comply with relevant Australian Standards, including AS4282-1997 (Control of the obtrusive effects of outdoor lighting).	Contractor	Operation	Additional safeguard V1

6.5 Geology, soils and water

6.5.1 Methodology

The following databases and documents were reviewed:

- Cessnock Local Environmental Plan 2011
- List of NSW contaminated sites notified to the EPA (NSW EPA)
- Contaminated land records of notices (NSW EPA)
- Australian Soil Resource Information System
- Phase 1 Environmental Site Assessment (Parsons Brinckerhoff, 2010).

6.5.2 Existing environment

Geology

The regional geological map of the area (1:100,000 Newcastle Coal Fields Regional Geology Series Sheet 9231, (Department of Mineral Resources 1995)) indicates that the proposal area is underlain by the Tomago Coal Measures, Waratah Sandstone and the Lambton Subgroup of the Newcastle Coal Measures. These geological units generally consist of sandstone, siltstone, coal and tuff.

The regional soil map of the area (1:100,000 Soil landscape Map for Newcastle (Mattei 1995)) indicates the proposal area is located within the Beresfield and Cockle Creek soil landscapes. The Beresfield landscape soils tend to be deep with sandy to silty topsoil on top of highly erodible subsoils. The subsoils have a high foundation hazard due to shrink-swell potential as well as areas of dispersive sodic soils.

The topography of the property is generally flat to slightly undulating however relatively flat in the proposal area due to prior site establishment. Land to the north of the proposal area slopes down slightly towards a farm dam.

Acid sulfate soils

Acid sulfate soils (ASS) are soils and sediments containing iron sulphides that, when exposed to oxygen, generate sulphuric acid and potentially toxic quantities of aluminium and other heavy metals. The sulfuric acid and heavy metals are produced in forms that can be readily released and absorbed into the environment, with potential adverse effects on the natural and built environment and human health.

The proposal area is not mapped within the Cessnock LEP as being within an area where ASS may occur. This was confirmed by a search of the Australian Soil Resource Information System on the 10 October 2016 which indicates the proposal area has an extremely low probability of ASS.

Contamination

The study area refers to the area of land previously disturbed by the Hunter Expressway pre-cast facility. This includes the previously disturbed compound site, batch plant and access road footprint of the site.

A search of the NSW EPA contaminated land records of notices on 10 October 2016 identified two sites within the Cessnock LGA. The closest site recorded is over six kilometres north-west of the proposal area. A search of the list of NSW contaminated sites notified to the EPA on 10 October 2016 did not identify any sites near the proposal area.

The Phase 1 Environmental Site Assessment carried out in 2010 included the footprint of the proposal. Potential on-site sources of contamination identified included pesticide and herbicide use. Contaminants of concern (COC) from pesticide and herbicide include Organochlorin and Organophosphorous pesticides however were identified as unlikely to pose a risk to human health and the environment. Potential off-site sources of contamination identified included the following:

- Activities associated with farming including potential use of pesticides and herbicides, including those used in the adjacent poultry farm
- Surface water run-off from the adjacent highway
- The former Richmond Vale Railway, located adjacent to the southern boundary of the study area

The assessment did not identify any contamination in the proposal area. The current condition of the proposal area would not be expected to be contaminated as a result of operation of the Hunter Expressway pre-cast facility given the nature of the previous work.

Catchment, surface water and flooding

The proposal area is located within the Hunter catchment. Surface waterways in proximity to the proposal area comprise Surveyors Creek and a large farm dam. Surveyors Creek generally traverses the property in a south easterly direction and is located about 40 metres east of the proposal area. A farm dam is located towards the north eastern corner of the property and is about 100 metres north of the proposal area.

The 20 year average recurrence interval (ARI) flood levels for the property range between 19.1 metres Australian Height Datum (AHD) (north) and 20.4 metres AHD (south). The 100 year ARI flood levels for the property range between 20.15 metres AHD (north) and 20.6 metres AHD (south). The proposal area is located above the 20 year and 100 year ARI flood levels and has been previously raised. As the proposal area is not located within flood liable land, flood impacts to the proposal were not considered further.

6.5.3 Potential impacts

The proposal would be contained within the area previously disturbed and established for the Hunter Expressway pre-cast facility. The proposal would not require any clearing or earthworks and therefore would not be expected to impact on soil and water quality during establishment.

During operation of the pre-cast facility there would be the potential for site runoff to have elevated pH levels as a result of the concrete works being carried out on site. However, existing infrastructure on site would capture and manage surface water on site to ensure that runoff leaving the site would not pollute nearby land or waterways. As detailed in **Section 3**, existing infrastructure would be inspected and any necessary repairs carried out before the facility is operational.

The proposal may require the storage of fuels, oils and other potentially harmful substances on-site. The impact of accidental spills or leaks of these substances is anticipated to be low given the site is already established and the relatively flat topography of the proposal area.

6.5.4 Safeguards and management measures

Table 6-11 identifies safeguards and management measures that will be implemented to address potential impacts of the proposal on soils and water.

Table 6-11 Mitigation measures for soil and water impacts

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Soil and water	Environmental safeguards (e.g. sediment fences, booms etc.) are to be inspected and repaired where necessary to be consistent with "Managing Urban Stormwater: Soils and Construction" (4th Edition Landcom, 2004, aka the Blue Book (see http://www.landcom.com.au/whatsnew/the-blue-book.aspx)).	Contractor	Construction	Additional safeguard SW-1
Contaminated land	If contaminated areas are encountered during construction, appropriate control measures will be implemented to manage the immediate risks of contamination. All other works that may impact on the contaminated area will cease until the nature and extent of the contamination has been confirmed and any necessary site-specific controls or further actions identified in consultation with the Roads and Maritime Environment Manager and/or EPA.	Contractor	Construction	Core standard safeguard C1 Section 4.2 of QA *G36 Environment Protection*
Accidental spill	A site specific emergency spill plan will be developed, and include spill management measures in accordance with the Roads and Maritime *Code of Practice for Water Management* (RTA, 1999) and relevant EPA guidelines. The plan will address measures to be implemented in the event of a spill, including initial response and containment,	Contractor	Pre-construction	Core standard safeguard C2 Section 4.3 of QA *G36 Environment Protection*

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
	notification of emergency services and relevant authorities (including Roads and Maritime and EPA officers).			
Storage of substances	Storage of fuels, oils and other potentially harmful substances are not to be stored in the carpark over the location of the previous HECC Site carpark due to flood risk.	Contractor	Construction and Operation	Additional safeguard C3

6.6 Biodiversity

6.6.1 Methodology

The assessment uses the following terms:

- The 'study locality'- the area within 10 kilometres of the study area
- The 'proposal area' is as defined in **Section 1.1.3**
- The 'study area'- refers to the proposal area and the area immediately surrounding the proposal area.

Review of literature, mapping and government databases

A desktop review was carried out of background reports, databases and mapping pertaining to the biodiversity of the bioregion and the study locality. These include:

- NSW Office of Environment and Heritage (OEH) Atlas of NSW Wildlife Database within a 10 kilometre radius of the proposal area
- EPBC Protected Matters Search Tool NSW Department of Primary Industries Noxious Weeds List (DPI, 2013)
- Ecological assessment prepared for the HECC Site (Parsons Brinckerhoff, 2010)
- LHCCREMS - Lower Hunter Central Coast Regional Environmental Strategy (LMCCREMS, 2009)

6.6.2 Existing environment

The proposal area is located in the Sydney Basin Bioregion and within the Hunter River catchment. Two state conservation areas are located near the proposal area and include the Sugarloaf State Conservation Area and Werakata State Conservation Area located about two kilometres south and three kilometres west of the proposal area respectively.

Vegetation communities

A search of the EPBC Protected Matters Search Tool on 13 October 2016 identified two listed Threatened Ecological Communities (TEC) as occurring or potentially occurring within the study locality. These include:

- Central Hunter Valley eucalypt forest and woodland
- White Box-Yellow Box- Blakely's Red Gum Grassy Woodland and Derived Native Grassland.

Vegetation mapping (LMCCREMS, 2009) of the surrounding area identified the following vegetation communities:

- Alluvial Tall Moist Forest
- Coastal Foothills Spotted Gum- Ironbark Forest
- Coastal Narrabeen Moist Forest
- Coastal Plains Smooth-barked Apple Woodland
- Hunter Lowland Redgum Forest
- Lower Hunter Spotted Gum- Ironbark Forest.

These vegetation communities are shown in **Figure 1-3**.

None of the TEC identified in the EPBC Protected Matters Search Tool or vegetation communities identified in the vegetation mapping occur in the proposal area as the area has previously been cleared for the Hunter Expressway pre-cast facility. The site consists of hardstand material which is populated with sparse exotic grassland.

Fauna habitats

Three fauna habitats were identified in the study area. The location of the identified fauna habitats in relation to the proposal area is presented in **Table 6-12**. Vegetation in the proposal area has been subject to clearing as a result of site establishment works. Existing vegetation in the proposal area is limited to sparsely distributed exotic grassland and therefore is not considered to provide suitable fauna habitat.

Table 6-12 Fauna habitat with corresponding vegetation description

Fauna habitat	Corresponding vegetation community	Location in relation to proposal area
Spotted Gum Ironbark Open Forest	Hinterland Spotted Gum-Red Ironbark Forest	Large patches located to the south of the proposal area.
Grazed Pasture Land	Exotic Grassland with Scattered Trees	Immediately surrounding and located within the proposal area.
Habitat trees	Various habitats	Surrounding the proposal area.

Flora

A search of the NSW OEH Atlas of NSW Wildlife database identified 917 records of flora species within the study locality. Vegetation in the proposal area is limited to sparse exotic grassland.

Threatened flora

The EPBC Protected Matters Search Tool identified 16 threatened flora species as occurring or potentially occurring within the study locality. It is not anticipated threatened flora would be present in the proposal area due to its low habitat potential.

Fauna

A search of the NSW OEH Atlas of NSW Wildlife database identified 351 records of fauna species within the study locality. It is not anticipated fauna would be present in the proposal area due to its low habitat potential.

Threatened fauna

The EPBC Protected Matters Search Tool identified 28 threatened fauna species as occurring or potentially occurring within the study locality. It is not anticipated that threatened fauna would be present in the proposal area due to its low habitat potential.

Migratory species

The EPBC Protected Matter Search Tool identified 33 migratory species as potentially occurring in the study locality. The proposal area would not provide suitable habitat for migratory species due to the areas low habitat potential.

Weeds

The following noxious weeds were identified in the study area and are presented in **Table 6-13**. Of the five noxious weeds identified, three are listed as noxious in the Cessnock LGA and are subject to the following control measures:

- Control class 3 - This plant must be fully and continuously suppressed and destroyed
- Control class 4 - The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed.

Table 6-13 Noxious weeds recorded in the Study Area

Scientific name	Common name	*Noxious Weeds Act 1993* control class[1]
Cestrum parqui	Green Cestrum	3[cl]
Lantana camara	Lantana	4[c,] 5[n]
Oxalis corniculata	Creeping Oxalis	5[n]
Rubus fruticosus	Blackberry	4[cn]
Xanthium occidentale	Noogoora Burr, Cockle Burr	4[l]

Notes: c- listed in Cessnock City Council control area, n- listed in all of NSW, l- listed in Lake Macquarie City control area.

Vegetation in the proposal area is limited to sparse exotic grassland and therefore there is potential for the noxious weeds identified in **Table 6-13** to occur in the proposal area.

6.6.3 Potential impacts

The proposal would not require any vegetation removal. The proposal area has been subject to previous disturbance and site establishment as a result of it being used as a pre-cast facility for the Hunter Expressway. As discussed in **Section 6.6.2**, the proposal area does not contain any threatened ecological communities, suitable fauna habitat or threatened species. Therefore no significant ecological impact as a result of the proposal has been anticipated.

Weeds may be present in the proposal area and have the potential to spread due to the movement of construction plant and equipment across the proposal area and when entering and exiting the site. This would be managed by the safeguards outlined in **Section 6.6.4**.

Conclusion on significance of impacts

The proposal would be unlikely to significantly impact threatened species, populations or ecological communities or their habitats, within the meaning of the TSC Act or *Fisheries Management Act 1994* and therefore a Species Impact Statement is not required.

The proposal would be unlikely to significantly impact threatened species, populations, ecological communities or migratory species, within the meaning of the EPBC Act.

6.6.4 Safeguards and management measures

Table 6-14 identifies safeguards and management measures that will be implemented to address potential impacts of the proposal on biodiversity.

Table 6-14 Safeguards and management measures for biodiversity

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Biodiversity	The requirements of the *Noxious Weeds Act 1993* will be followed, and weed removal activities will follow Guide 6 (Weed Management) of the Roads and Maritime Biodiversity Guidelines.	Contractor	Pre-construction	Additional safeguard
Biodiversity	Machinery will be cleaned prior to entering and exiting the site to ensure that weed seeds and propagules are not imported to or exported from the site.	Contractor	Construction	Additional safeguard

6.7 Aboriginal heritage

6.7.1 Methodology

The assessment uses the following terms:

- The 'study area'- The study area refers to the Aboriginal Heritage Information Management System (AHIMS) search area which encompasses a buffer of 50 metres from the proposal area.

The following databases and documents were reviewed:

- Aboriginal Heritage Information Management System (AHIMS) Web Services (Office of Environment and Heritage, 2016)
- Aboriginal Cultural Heritage and Archaeological Survey and Assessment of the Hunter Expressway Alliance Project Office Compound and Batch Plant, near Buchanan, New South Wales (Umwelt (Australia) Pty Limited, 2010).

6.7.2 Existing environment

History of the People

The proposal is located within the boundary of the Mindaribba Local Aboriginal Land Council. According to Aboriginal stakeholder knowledge and oral histories there are ceremonial grounds, burials, camping grounds, scarred trees, stone arrangements, rock art and a massacre site in the vicinity of the Hunter Expressway (Umwelt (Australia) Pty Limited, 2010).

Sites and places

An extensive search undertaken in November 2016 identified three registered sites in the study area. None of the sites identified are located within the proposal area (refer to **Figure 1-3**). The proposal would be contained within land previously disturbed for the establishment and operation of a pre-cast facility for the Hunter Expressway project. As such, there is limited potential for unexpected Aboriginal sites or places to occur within the proposal area.

Archaeological potential

No areas of archaeological potential were identified in the proposal area.

6.7.3 Potential impacts

The proposal would be contained within the previously disturbed and established HECC Site and would not result in any ground disturbance. As such, there would be no potential for impacts to identified Aboriginal sites and it would be unlikely for any unidentified Aboriginal sites/places to be impacted.

6.7.4 Safeguards and management measures

Table 6-15 identifies safeguards and management measures that will be implemented to address potential impacts of the proposal on Aboriginal heritage.

Table 6-15 Safeguards and management measures for Aboriginal heritage

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Aboriginal heritage	• The *Standard Management Procedure - Unexpected Heritage Items* (Roads and Maritime, 2015) will be followed in the event that an unknown or potential Aboriginal object/s, including skeletal remains, are found during construction. This applies where Roads and Maritime does not have approval to disturb the object/s or where a specific safeguard for managing the disturbance (apart from the Procedure) is not in place • Work will only re-commence once the requirements of that procedure have been satisfied.	Contractor	Construction and Operation	Core standard safeguard AH-1 Section 4.9 of QA *G36 Environment Protection*

6.8 Land use, property and socio-economic

6.8.1 Methodology

This assessment was based on a desktop assessment of land use zoning, aerial photography, property boundaries and socio-economic characteristics.

6.8.2 Existing environment

Land use

The proposal area is zoned RU2 Rural Landscape under the Cessnock LEP. The proposal area is located on privately owned rural property on land previously established and operated as a pre-cast facility for the Hunter Expressway project. Surrounding land uses within the property comprise of agricultural pasture land used for cattle grazing and poultry farming.

Land use zones surrounding the property include:

- E1- National Parks and Nature Reserves
- SP2 (railway) - Infrastructure
- SP2 (classified road) - Infrastructure.

Property ownership

As outlined in **Section 3.6**, the proposal is located on private property owned by a private land owner. Land adjacent to the southern boundary of the property is owned by Coal and Allied Operations Pty Ltd (Coal and Allied). The electricity easement which traverses through the property in a north westerly direction is owned by Ausgrid.

Socio-economic characteristics

The proposal is located on property that is used for cattle grazing and poultry farming. The poultry farm is located about 500 metres north west of the proposal area and is accessed from George Booth Drive via an access road located to the west of the property boundary.

Surrounding businesses are limited to small local businesses located on the surrounding rural properties. The Orica Kurri Technical Centre is located about 950 metres south of the property and the Kurri Kurri town centre is located about six kilometres north west of the property.

6.8.3 Potential impacts

The proposal would require a short term lease of about four hectares of the private property for the duration of the construction of the New M5. The affected landholder would be consulted prior to and during construction/operation of the proposal. Consultation carried out to date with the affected landholder is discussed in **Section 5.4**.

The proposal has the potential to cause minor disruptions to local businesses. This would mostly be due to minor traffic delays (refer to **Section 6.1**) and noise impacts (refer to **Section 6.2**) .The proposal also has the potential to have a positive impact by stimulating the local economy through increased customers for local businesses.

During operation, the proposal would have some minor negative impacts on the landowner and community for the following environmental factors:

- Transport, access and connectivity, this is addressed in **Section 6.1**
- Visual amenity, this is addressed in **Section 6.4**
- Noise and Vibration, this is addressed in **Section 6.2**
- Air quality, this is addressed in **Section 6.9**.

6.8.4 Safeguards and management measures

No additional safeguards or management measures were identified. Measures to manage impact associated with noise, visual amenity, traffic and air quality are outlined in the following sections:

- Transport, access and connectivity, this is addressed in **Section 6.1.4**
- Visual amenity, this is addressed in **Section 6.4.4**
- Noise and Vibration, this is addressed in **Section 6.2.5**
- Air quality, this is addressed in **Section 6.9.2**.

6.9 Other impacts

6.9.1 Existing environment and potential impacts

Table 6-16 identifies the existing environment and potential impact of the proposal on air quality and waste and resource management.

Table 6-16 Existing environment and potential impacts on air quality and waste and resource management

Environmental factor	Existing environment	Potential impacts
Air quality	**Nearby receivers** Three sensitive receivers (residential dwellings) are located within the property (refer to **Figure 6-1**). The closest residential dwelling is located about 530 metres west of the proposal area. **Ambient air quality** No air quality monitoring was carried out specifically for this proposal. The OEH operates a nearby ambient air quality monitoring station at Beresfield. Beresfield is located about 12 kilometres to the north east and is the closest station to the proposal. The Beresfield air quality monitoring station records nitrogen dioxide (NO_2), carbon monoxide (CO), ozone (O_3), sulphur dioxide (SO_2), PM_{10}, $PM_{2.5}$ and visibility (NEPH). Data collected for the period 2015-2016 showed that there were no days when the pollutants exceeded the criteria except for PM_{10} and NEPH. The 24-hour average criterion for PM_{10} (50 mg/m^3) was exceeded once in November 2015 and the one-hour average criterion for NEPH was exceeded once during December 2015 and two times during April 2016. Many OEH monitoring stations record that the PM_{10} criteria is exceeded a few times each year. This is typically driven by unavoidable events, such as dust storms, bushfires and hazard reduction burns, though other emission sources may include industry, motor vehicles, and domestic activities such as solid fuel heaters.	During operation of the proposal, air quality may be temporarily affected as a result of particulate (dust) and gaseous (vehicle exhaust and volatile organic compounds) emissions. The total amount of dust generated would depend on the silt and moisture content of the soil, the types of activities being carried out, the size of exposed areas, the frequency of water spraying and the speed of machinery. Primary sources of dust and exhaust emissions include: • Vehicles entering and leaving the site, and on-site machinery • Storage of fuel and refuelling activities • Inadequate equipment maintenance. Given that the proposal would not result in any soil disturbance and that that air quality impacts can be managed through the implementation of standard management measures, the impacts to ambient air quality from the proposal would be temporary and minor.

Environmental factor	Existing environment	Potential impacts
Waste and resource management	The proposal area does not generate waste as the site has not been operational for several months.	**Waste** Operation of the proposal would generate waste streams, including: • Concrete • Oil, grease and other liquid wastes from the maintenance of construction plant and equipment • General construction waste • Domestic waste from construction personnel. Volumes of waste generated by the proposal would be readily managed through the application of standard mitigation measures. **Resource use** Construction activities would require concrete and water (refer to **Section 3.3.5**). The proposal would not create a substantial demand on these resources, such they would become in short supply.
Hazard and risk	An Ausgrid electricity easement which comprises two 33 kilovolt power lines and one 11 kilovolt power line with a clearance of eight metres traverses through the proposal area in a north westerly direction.	Environmental hazards associated with the proposal could arise during transporting, use and storage of hazardous materials on site. These would be readily managed through the application of standard mitigation measures. Occupational health and safety hazards include transporting construction plant and materials beneath the Ausgrid electricity lines. The access road is located both adjacent to and beneath two 33 kilovolt power lines and one 11 kilovolt power line with a clearance of eight metres. Transportation of oversized plant and facilities beneath these power lines could present occupational health and safety hazard to construction workers. Construction hazards would also relate to the transportation of construction plant and materials beneath the Ausgrid electricity lines. Hazards and risks would be minimised by the implementation of the safeguards outlined in **Table 6-17**.

6.9.2 Safeguards and management measures

Table 6-17 identifies safeguards and management measures that will be implemented to address potential impacts of the proposal on air quality and waste and resource management.

Table 6-17 Mitigation measures for air quality and waste impacts

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Air quality, Waste and Hazard and risk management	A Project Environmental Management Plan (PEMP) will be prepared and implemented prior to construction. The PEMP would detail risks and standard management measures to reduce impacts on air quality, waste and hazard and risk management.	Contractor	Pre-construction	Additional O-1

6.10 Cumulative impacts

Cumulative impacts have the potential to arise from the interaction of individual elements of the proposal and the additive effects of the proposal with other external projects. Under Clause 228 (2) of the EP&A Act, Roads and Maritime is required to take into account potential cumulative impacts as a result of the proposal.

6.10.1 Methodology

Other locally occurring developments that could interact with the proposal were identified through a desktop review of publically available information on the Department of Planning and Environment's (DPE) major project register and the Cessnock City Council's online development application tracker. The desktop search was carried out on 13 October 2016 for the Cessnock LGA for both the DPE major project register and online development application tracker. Minor developments, such as minor alterations to dwellings, were not included due to the limited nature and extent of those developments and, therefore, the minimal interaction with the current proposal.

The assessment of the significance of potential cumulative impacts considered the location and timing of the potential developments. Where the timing of a development was not known at the time of writing this REF, the assessment assumed a worst-case scenario in that the proposal would coincide with that development.

Potentially occurring developments

The proposal would be required for the duration of the construction of the New M5 which is anticipated to be about three and a half years. Site establishment work for the New M5 has commenced, with major construction expected to start in the coming months. The New M5 is scheduled to open in 2019. The developments have the potential to interact with the proposal are presented below.

New M5

The New M5 forms part the wider WestConnex program of works which aims to improve access and connectivity for the wider Sydney Metropolitan region. The New M5 is a new, tolled multi-lane road link between the existing M5 East Motorway, east of King Georges Road and St Peters. The proposal is required to facilitate construction of the New M5, therefore would directly overlap with the expected construction timeframe of the New M5. The New M5 is located over 222 kilometres south of the proposal however would interact with the proposal through the delivery of pre-cast components to St Peters (four to six deliveries per day). Management of construction traffic

impacts from the proposal would be incorporated into the Traffic Management Plan for the New M5 construction.

Other developments

A number of developments listed on the DPE major projects register are proposed in Kurri Kurri and Loxford and include:

- Thermal Waste Processing Project (about seven kilometres north west)
- Former Hydro Aluminium Kurri Kurri Smelter Demolition and Remediation (about eight kilometres north west)
- Kurri Kurri Battery Recycling Facility (about seven kilometres north west)
- Energy from Waste (EFW) Plant (about seven kilometres north west)
- Ammonium nitrate storage distribution facility in the Hunter Economic Zone (HEZ) (about 17 kilometres west)
- Hunter Industrial Ecology Park including a Waste to Energy Plant, a Materials Recovery Facility, a Community Drop off Centre, and an Administration Centre (including a Testing Laboratory, a Research Centre, an Education Centre, and a Maintenance Facility) plus Community Title Subdivision into 23 Lots (about seven kilometres north west).

Timing of construction and operation of these developments is unknown apart from the Thermal Waste Processing Project which is anticipated to start construction in early 2017 for a duration of six months. Construction of the Thermal Waste Processing Project would overlap with timing of the proposal.

Operations of existing developments that have the potential to interact with the proposal include:

- Ammonium Nitrate Emulsion Facility (about two kilometres south)
- Bloomfield Colliery (about five kilometres north east)
- Abel Coal mine (about three kilometres east).

6.10.2 Potential impacts

No cumulate traffic impacts are expected. Noise, vibration and air quality impacts associated with the above proposals are expected to be identified and managed at a project level through appropriate noise, vibration and air quality mitigation measures and due to the distance between the proposals, cumulative impacts are not expected. The proposed developments identified above are all located west of Kurri Kurri and are expected to direct traffic to the Hunter Express Way in preference to George Booth Drive.

6.10.3 Safeguards and management measures

The potential for adverse cumulative impacts is most effectively addressed by the application of individual safeguards recommended throughout **Chapter 6** of this REF and summarised in **Section 7.2**. An additional safeguard is recommended in **Table 6-18**.

Table 6-18 Mitigation measures for cumulative environmental impacts

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Cumulative construction impacts	Consultation with surrounding projects or developments to: • Increase awareness of construction timeframes and impacts • Coordinate impact mitigation and management (e.g. respite periods).	Contractor	Pre-construction/ construction	Additional safeguard CU-1

7 Environmental management

This chapter describes how the proposal will be managed to reduce potential environmental impacts throughout detailed design, construction and operation. A framework for managing the potential impacts is provided. A summary of site-specific environmental safeguards is provided and the licence and/or approval requirements required prior to construction are also listed.

7.1 Environmental management plans (or system)

A number of safeguards and management measures have been identified in the REF in order to minimise adverse environmental impacts, including social impacts, which could potentially arise as a result of the proposal. Should the proposal proceed, these safeguards and management measures would be incorporated into the detailed design and applied during the construction and operation of the proposal.

A Project Environmental Management Plan (PEMP) will be prepared to describe the safeguards and management measures identified. The PEMP will provide a framework for establishing how these measures will be implemented and who would be responsible for their implementation.

The PEMP will be prepared prior to construction and use of the proposal and must be reviewed and certified by the Roads and Maritime Environment Officer prior to the commencement of any on-site works. The PEMP would be developed in accordance with the specifications set out in the QA Specification G36 – Environmental Protection (Management System), QA Specification G38 – Soil and Water Management (Soil and Water Plan), QA Specification G10 - Traffic Management.

7.2 Summary of safeguards and management measures

Environmental safeguards and management measures outlined in this REF will be implemented during construction and operation of the proposal, should it proceed. These safeguards and management measures will minimise any potential adverse impacts arising from the proposed works on the surrounding environment. The safeguards and management measures are summarised in **Table 7-1**.

Table 7-1: Summary of safeguards and management measures

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
General					
GEN-1	General - minimise environmental impacts during construction	A PEMP will be prepared and submitted for review and endorsement of the Roads and Maritime Environment Manager prior to commencement of the activity. As a minimum, the PEMP will address the following: • any requirements associated with statutory approvals • details of how the project will implement the identified safeguards outlined in the REF • issue-specific environmental management plans • roles and responsibilities • communication requirements • induction and training requirements • procedures for monitoring and evaluating environmental performance, and for corrective action • reporting requirements and record-keeping • procedures for emergency and incident management • procedures for audit and review. The endorsed PEMP will be implemented during the undertaking of the activity.	Contractor / Roads and Maritime project manager	Pre-construction / detailed design	Core standard safeguard GEN-1

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
GEN-2	General - notification	All businesses, residential properties and other key stakeholders (eg schools, local councils) affected by the activity will be notified at least five days prior to commencement of the activity.	Contractor / Roads and Maritime project manager	Pre-construction	Core standard safeguard GEN-2
GEN-3	General – environmental awareness	All personnel working on site will receive training to ensure awareness of environment protection requirements to be implemented during the project. This will include up-front site induction and regular "toolbox" style briefings.	Contractor / Roads and Maritime project manager	Pre-construction / detailed design	Core standard safeguard GEN-3
Traffic and transport					
TT-1	Traffic and transport	A Traffic Management Plan (TMP) will be prepared and implemented as part of the PEMP. The TMP will be prepared in accordance with the Roads and Maritime *Traffic Control at Work Sites Manual* (RTA, 2010) and *QA Specification G10 Control of Traffic* (Roads and Maritime, 2008). The TMP will include: • Confirmation of haulage routes • Measures to maintain access to local roads and properties • Site specific traffic control measures (including signage) to manage and regulate traffic movement • Measures to maintain pedestrian and cyclist access • Requirements and methods to consult and inform the local community of impacts on the local road network • Access to construction sites including entry and exit locations and measures to prevent construction vehicles queuing on public roads • A response plan for any construction traffic incident • Consideration of other developments that may be under construction to minimise traffic conflict and congestion that may occur due to the cumulative increase in construction vehicle traffic • Monitoring, review and amendment mechanisms.	Contractor	Detailed design / Pre-construction	Core standard safeguard TT1 Section 4.8 of QA *G36 Environment Protection*

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Noise and vibration					
N-1	Noise impacts from proposal	The following at-source control measures are recommended to reduce potential noise impacts: • Noise control kits • Limit equipment in use • Timing of equipment in use • Limit activity duration • Use and siting of plant • Equipment selection • Non-tonal reversing alarms.	Contractor	Construction and Operation	Additional standard N1
N-2	Noise impacts from proposal	The following noise management measures are recommended for inclusion into the PEMP: • Site inductions and toolbox talks • Community consultation • Behavioural practices.	Contractor	Construction and Operation	Additional standard N2
N-3	Noise exceedances at receivers	Attended noise monitoring will be carried out to verify noise levels from the proposal at receiver C_02. Monitoring will be carried out in accordance with the procedures in Appendix F of the WestConnex Stage 2 Construction Noise and Vibration Management Plan.	Contractor	Construction and Operation	Additional standard N3
N-4	Complaints	Noise complaints will be responded to and addressed in accordance with the WestConnex Stage 2 Construction Noise and Vibration Management Plan and the Construction Complaints Management System.	Roads and Maritime/ Contractor	Construction and Operation	Additional standard N4
Non- Aboriginal heritage					
H-1	Non-Aboriginal	• The *Standard Management Procedure - Unexpected Heritage Items*	Contractor	Constructio	Core

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
	heritage	(Roads and Maritime, 2015) will be followed in the event that any unexpected heritage items, archaeological remains or potential relics of Non-Aboriginal origin are encountered. • Work will only re-commence once the requirements of that Procedure have been satisfied.		n and Operation	standard safeguard H-1 Section 4.10 of QA *G36 Environment Protection*
H-2	Non-Aboriginal heritage	• Non-Aboriginal heritage awareness training will be provided for all contractors and personnel before the start of construction to provide an awareness of retained heritage items within the vicinity of the proposal and required management measures, to ensure understanding of the procedure required to be carried out in the event of discovery of non-Aboriginal heritage materials, features or deposits, or the discovery of human remains.	Contractor	Pre-construction	Additional safeguard H-2
Visual					
V-1	Visual impact	To reduce the potential visual impact of construction activities: • Work sites will be left tidy at the end of each work day • Lighting for night-time work will comply with relevant Australian Standards, including AS4282-1997 (Control of the obtrusive effects of outdoor lighting).	Contractor	Operation	Additional safeguard V-1
Geology, soils and water					
SW-1	Soil and water	Environmental safeguards (e.g. sediment fences, booms etc.) are to be inspected and repaired to be consistent with “Managing Urban Stormwater: Soils and Construction” (4th Edition Landcom, 2004, aka the Blue Book (see http://www.landcom.com.au/whatsnew/the-blue-book.aspx)).	Contractor	Construction	Additional safeguard SW-1

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
C-1	Contaminated land	If contaminated areas are encountered during construction, appropriate control measures will be implemented to manage the immediate risks of contamination. All other works that may impact on the contaminated area will cease until the nature and extent of the contamination has been confirmed and any necessary site-specific controls or further actions identified in consultation with the Roads and Maritime Environment Manager and/or EPA.	Contractor	Construction	Core standard safeguard C-1 Section 4.2 of QA *G36 Environment Protection*
C-2	Accidental spill	A site specific emergency spill plan will be developed, and include spill management measures in accordance with the Roads and Maritime *Code of Practice for Water Management* (RTA, 1999) and relevant EPA guidelines. The plan will address measures to be implemented in the event of a spill, including initial response and containment, notification of emergency services and relevant authorities (including Roads and Maritime and EPA officers).	Contractor	Pre-construction	Core standard safeguard C-2 Section 4.3 of QA *G36 Environment Protection*
C-3	Storage of substances	Storage of fuels, oils and other potentially harmful substances are not to be stored in the carpark over the location of the previous HECC Site carpark due to flood risk.	Contractor	Construction and Operation	Additional safeguard
Biodiversity					
B-1	Biodiversity	The requirements of the *Noxious Weeds Act 1993* will be followed, and weed removal activities will follow Guide 6 (Weed Management) of the Roads and Maritime Biodiversity Guidelines	Contractor	Pre-construction	Additional safeguard
B-2	Biodiversity	Machinery will be cleaned prior to entering and exiting the site to ensure that weed seeds and propagules are not imported to or exported from the site.	Contractor	Construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Aboriginal heritage					
AH-1	Aboriginal heritage	• The *Standard Management Procedure - Unexpected Heritage Items* (Roads and Maritime, 2015) will be followed in the event that an unknown or potential Aboriginal object/s, including skeletal remains, is found during construction. This applies where Roads and Maritime does not have approval to disturb the object/s or where a specific safeguard for managing the disturbance (apart from the Procedure) is not in place. • Work will only re-commence once the requirements of that Procedure have been satisfied.	Contractor	Construction an Operation	Core standard safeguard AH-1 Section 4.9 of QA *G36 Environment Protection*
Other impacts					
O-1	Air quality, Waste and Hazard and risk management	A Project Environmental Management Plan (PEMP) will be prepared and implemented prior to construction. The PEMP would detail risks and standard management measures to reduce impacts on air quality, waste and hazard and risk management.	Contractor	Pre-construction	Additional O-1
Cumulative impacts					
CU-1	Cumulative construction impacts	Consultation with surrounding projects or developments to: • Increase awareness of construction timeframes and impacts • Coordinate impact mitigation and management (e.g. respite periods).	Contractor	Pre-construction /construction	Additional safeguard CU-1

7.3 Licensing and approvals

NSW Oversize Overmass Load Carrying Vehicle permits may be required for access from George Booth Drive to the proposal area for some pre-cast component deliveries. The remainder of the road network between the site and Sydney is part of the NSW Oversize Overmass Load Carrying Vehicles Network Approved Routes which represents the legally enforceable network for eligible vehicles operating under the Multi-State Class 1 Load Carrying Vehicles Mass Exemption Notice. Where ineligible vehicles are used additional Oversize Overmass Load Carrying Vehicle permits may be required.

No other additional licenses or approvals are required for the proposal.

8 Conclusion

This chapter provides the justification for the proposal taking into account its biophysical, social and economic impacts, the suitability of the site and whether or not the proposal is in the public interest. The proposal is also considered in the context of the objectives of the EP&A Act, including the principles of ecologically sustainable development as defined in Schedule 2 of the *Environmental Planning and Assessment Regulation 2000*.

8.1 Justification

The proposal would support the construction of road projects in NSW, in particular the New M5 project that is part of the wider WestConnex program of works. The WestConnex program of works aims to improve access and connectivity for the wider Sydney Metropolitan region. The New M5 will link to the upgraded King Georges Road Interchange on the existing M5 East Motorway at Beverly Hills and run via twin tunnel to St Peters. The New M5 tunnels will more than double the capacity of the M5 East corridor, improving travel times and reliability for the 100, 000 motorists which use this key route every day. The proposal would support the construction of the New M5 by providing a facility to produce pre-cast components for the New M5 that is otherwise not available.

In the absence of space within the approved New M5 construction footprint, alternative options have been assessed and were not considered viable. The proposed use of the existing pre-cast facility would have limited impacts on the environment and nearby receptors. It would also contribute to the local economy through increased customers for local business. Standard mitigation measures are available to manage the impacts identified.

8.2 Objects of the EP&A Act

Table 8-1 identifies the objects of the EP&A Act and their relevance to the project.

Table 8-1 Summary of Objects of the EP&A Act

Object	Comment
5(a)(i) To encourage the proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment.	Safeguard measures detailed in this REF would allow for the proper management, development and conservation of natural and artificial resources. The proposal would not require any vegetation removal or ground disturbance. Social and economic impacts of the proposal were considered and were considered to be minor in nature.
5(a)(ii) To encourage the promotion and co-ordination of the orderly economic use and development of land.	Not relevant to the project.
5(a)(iii) To encourage the protection, provision and co-ordination of communication and utility services.	Not relevant to the project.
5(a)(iv) To encourage the provision of land for public purposes.	Not relevant to the project.
5(a)(v) To encourage the provision and co-ordination of community services and facilities.	Not relevant to the project.

Object	Comment
5(a)(vi) To encourage the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats.	The proposal would not require any vegetation clearance. There are no threatened ecological communities, threatened species or suitable habitat in the proposal area. Therefore no significant ecological impact as a result of the proposal is anticipated.
5(a)(vii) To encourage ecologically sustainable development.	Ecologically sustainable development is considered in **Sections 8.2.1** to **8.2.4** below.
5(a)(viii) To encourage the provision and maintenance of affordable housing.	Not relevant to the project.
5(b) To promote the sharing of the responsibility for environmental planning between different levels of government in the State.	Not relevant to the project.
5(c) To provide increased opportunity for public involvement and participation in environmental planning and assessment.	Consultation would be carried out with the affected landowner.

8.2.1 The precautionary principle

The precautionary principle provides that where there is a threat of serious or irreversible environmental damage, the absence of full scientific certainty should not be used as a reason to postpone measures to avoid environmental degradation. This REF is consistent with the precautionary principle and with accepted scientific and assessment methodologies. This is because:

- It has been based on detailed environmental investigations, which identified a range of potential impacts associated with the construction and operation of the proposal (refer to **Chapter 6**)
- The planning process for the proposal included the evaluation and assessment of alternative options that aimed to reduce the risk of serious and irreversible impacts on the environment as a result of the proposal
- The proposal has sought to take a precautionary approach to minimising environmental impacts. This was applied through the development of a range of environmental safeguards, which are summarised in **Chapter 7**. These safeguards would be implemented during construction and operation of the proposal. No mitigation measures or safeguards have been postponed as a result of lack of scientific certainty. CDS JV would be required to prepare a PEMP before commencing the re-establishment and use of the site.

8.2.2 Intergenerational equity

Intergenerational equity provides that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.

The proposal would facilitate construction of the New M5. The New M5 would benefit future generations by improving access and connectivity for the wider Sydney Metropolitan region by reducing traffic congestion, reducing travelling times and improving road safety.

Implementation of the safeguards outlined in this REF would ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.

The proposal may have some adverse impacts on the current generation, but these are not considered to be of a nature or extent that would disadvantage future generations.

8.2.3 Conservation of biological diversity and ecological integrity

The conservation of biological diversity and ecological integrity must be maintained and improved to ensure their survival.

The proposal would not require any vegetation removal. As discussed in **Section 6.6.2** the proposal area does not contain any threatened ecological communities, suitable fauna habitat or threatened species. Therefore no significant ecological impacts as a result of the proposal are anticipated.

Any potential impacts would be minimised through the proposed safeguards outlined in **Section 6.6.4**.

8.2.4 Improved valuation, pricing and incentive mechanisms

Environmental and social issues were considered in the strategic planning and establishment of the need for the proposal, and in consideration of various proposal options. The value placed on environmental resources is evident in the extent of the planning and environmental investigations, and in the design of the proposed mitigation measures and safeguards.

Implementation of these mitigation measures and safeguards would result in an economic cost to CDS JV, which are included in the capital cost of the New M5 construction project.

8.3 Conclusion

The proposal to use the existing HECC Site at Buchanan in the Cessnock LGA is subject to assessment under Part 5 of the EP&A Act. The REF has examined and taken into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the proposed activity.

This has included consideration (where relevant) of conservation agreements and plans of management under the NPW Act, joint management and biobanking agreements under the TSC Act, wilderness areas, critical habitat, impacts on threatened species, populations and ecological communities and their habitats and other protected fauna and native plants. It has also considered potential impacts to matters of national environmental significance listed under the EPBC Act.

The proposal as described in the REF best meets the proposal objectives but would still result in some impacts on traffic and transport, noise and vibration, visual and air quality. Safeguards and management measures as detailed in this REF would mitigate these expected impacts. The proposal would also facilitate construction of the New M5 and contribute to the local economy through increased patronage of local business. On balance the proposal is considered justified and the following conclusions are made.

Significance of impact under NSW legislation

The proposal would be unlikely to cause a significant impact on the environment. Therefore it is not necessary for an environmental impact statement to be prepared and approval to be sought from the Minister for Planning under Part 5.1 of the EP&A Act. A Species Impact Statement is not required. The proposal is subject to assessment under Part 5 of the EP&A Act. Consent from Council is not required.

Significance of impact under Australian legislation

The proposal is not likely to have a significant impact on matters of national environmental significance or the environment of Commonwealth land within the meaning of the EPBC Act. A referral to the Australian Department of the Environment and Energy is not required.

9 Certification

This review of environmental factors provides a true and fair review of the proposal in relation to its potential effects on the environment. It addresses to the fullest extent possible all matters affecting or likely to affect the environment as a result of the proposal.

Thomas Muddle
Senior Environmental Planner
Jacobs
Date: 29/11/2016

I have examined this review of environmental factors and accept it on behalf of Roads and Maritime Services.

Nicholas Francesconi
Principal Manager Environment
Network Motorways
Date: 5/12/16

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Terms and acronyms used in this REF

Term / Acronym	Description
AHD	Australian Height Datum
AHIMS	Aboriginal Heritage Information Management System
ARI	Average recurrence interval
ASS	Acid sulfate soils
CDS JV	CPB, Dragados, Samsung Joint Venture
COC	Contaminants of concern
DECC	NSW Department of Environment and Climate Change
DPI	Department of Primary Industries
DUAP	Department of Urban Affairs and Planning
EEC	Endangered Ecological Communities
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EP&A Act	*Environmental Planning and Assessment Act 1979*
EPA	NSW Environmental Protection Authority
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth). Provides for the protection of the environment, especially matters of national environmental significance, and provides a national assessment and approvals process
EPL	Environmental protection licence
ESD	Ecologically sustainable development
FM Act	*Fisheries Management Act 1994*
HECC Site	Hunter Expressway Construction Compound Site
HEZ	Hunter Economic Zone
ICNG	Interim Construction Noise Guideline
ISEPP	State Environmental Planning Policy (Infrastructure) 2007. The objective of this SEPP is to facilitate the effective delivery of infrastructure across the State
LEP	Local Environment Plan
LGA	Local government area

Term / Acronym	Description
NEPH	Measurement for visibility collected using a nephelometer
NPW Act	*National Parks and Wildlife Act 1974*
NSW	New South Wales
OEH	Office of Environment and Heritage (formerly Department of Environment, Climate Change and Water)
PEMP	Project environmental management plan
POEO Act	*Protection of the Environment Operations Act 1997*
REF	Review of Environmental Factors
RTA	Roads and Traffic Authority (now Roads and Maritime)
SEPP	State Environmental Planning Policy
TEC	Threatened ecological communities
TMP	Traffic management plan
TSC Act	*Threatened Species Conservation Act 1995* (NSW)

Appendix A

Consideration of clause 228(2) factors and matters of national environmental significance

Clause 228(2) Checklist

In addition to the requirements of the *Is an EIS required?* guideline (DUAP 1995/1996) and the *Roads and Related Facilities EIS Guideline* (DUAP 1996) as detailed in the REF, the following factors, listed in clause 228(2) of the *Environmental Planning and Assessment Regulation 2000*, have also been considered to assess the likely impacts of the proposal on the natural and built environment.

Factor	Impact
a. Any environmental impact on a community? Construction of the proposal would result in some short-term negative impacts on traffic, noise and vibration and visual amenity. These issues could impact negatively on the identified sensitive receivers and community as described in **Section 6.1** (traffic, transport and access), **Section 6.2** (noise and vibration) and **Section 6.4** (visual impacts). These impacts would be managed according to the safeguards outlined in **Chapter 7**.	Short-term, minor, negative
b. Any transformation of a locality? During construction and operation, the proposal would result in temporary impacts on the existing locality, which would be predominantly through negative visual amenity impacts associated with visibility of site facilities and associated operational activities, presence of construction plant and equipment, construction vehicles movements within proposal area and light spill from any potential night work and construction vehicles. These impacts would be managed according to the safeguards outlined in **Chapter 7**.	Short-term, minor, negative
c. Any environmental impact on the ecosystems of the locality? The proposal would not impact on the ecosystems of the locality.	Nil
d. Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality? The construction and operation of the proposal would result in temporary moderate-low visual impacts to the three identified sensitive receivers (residential dwellings) identified within the property. Visual impacts would be associated with the visibility of the associated use including presence of construction plant and equipment, construction vehicles movements within proposal area and light spill from any potential night work and construction vehicles are considered to result from the proposal Visual impacts as a result of the proposal would be temporary and limited to the duration of construction of the New M5. At the completion of New M5 construction works all plant and equipment brought to the site in relation to the New M5 construction would be removed and the site returned to its existing state.	Short-term, minor, negative
e. Any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations? The construction and operation of the proposal would result in temporary moderate-low visual impacts to the three identified sensitive receivers (residential dwellings) identified within the property. Visual impacts would be associated with operational activities, presence of construction plant and equipment, construction vehicles movements within proposal area and light	Short-term, minor, negative

Factor	Impact
spill from any potential night work and construction vehicles. Visual impacts as a result of the proposal would be temporary and limited to the duration of construction of the New M5. At the completion of New M5 construction works the site would be returned to its existing state.	
f. Any impact on the habitat of protected fauna (within the meaning of the *National Parks and Wildlife Act* 1974)? The proposal would not impact on the habitat of protected fauna.	Nil
g. Any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air? The proposal would not endanger any species of animal, plant or other form of life, whether living on land, in water or in the air.	Nil
h. Any long-term effects on the environment? The proposal would facilitate construction of the New M5. The New M5 tunnels will more than double the capacity of the M5 East corridor, improving travel times and reliability for the 100,000 motorists which use this key route every day.	Long-term, moderate, positive
i. Any degradation of the quality of the environment? The proposal has the potential to degrade the quality of the environment as a result of traffic, noise and air quality impacts. These impacts would be managed according to the safeguards outlined in **Chapter 7**.	Short-term, minor, negative
j. Any risk to the safety of the environment? Occupational health and safety hazards include transporting construction plant and materials beneath the Ausgrid electricity lines. These impacts would be managed according to the safeguards outlined in **Chapter 7**.	Short-term, minor, negative
k. Any reduction in the range of beneficial uses of the environment? The proposal is located on the land that previously operated as a precast facility for the Hunter Expressway. The use of the site does not limit the existing surrounding agricultural uses.	Nil
l. Any pollution of the environment? The proposal has the potential to generate pollution as a result of traffic, noise and air quality impacts. These impacts would be managed according to the safeguards outlined in **Chapter 7**.	Short-term, minor, negative
m. Any environmental problems associated with the disposal of waste? Operation of the proposal would generate waste streams, including: • Concrete • Oil, grease and other liquid wastes from the maintenance of construction plant and equipment • General construction waste • Domestic waste from construction personnel. Volumes of waste generated by the proposal would be readily managed through the application of standard mitigation measures outlined in **Chapter 7** .	Short-term, minor, negative
n. Any increased demands on resources (natural or otherwise) that are, or	Nil

Factor	Impact
are likely to become, in short supply? The proposal would require resources such as concrete and water, which are common construction materials. The proposal would not create a substantial demand on these resources.	
o. Any cumulative environmental effect with other existing or likely future activities? Operation of the proposal may overlap with other local developments within the area and with the construction of the New M5. Given the nature of the proposal, cumulative impacts as a result of concurrent development is anticipated to be minor and would be managed according to safeguards outlined in **Section 6.10**.	Short-term, minor, negative
p. Any impact on coastal processes and coastal hazards, including those under projected climate change conditions? The proposal would not result in any impact on coastal processes and coastal hazards including those under projected climate change conditions.	Nil

Matters of National Environmental Significance

Under the environmental assessment provisions of the *Environment Protection and Biodiversity Conservation Act 1999*, the following matters of national environmental significance and impacts on Commonwealth land are required to be considered to assist in determining whether the proposal should be referred to the Australian Government Department of the Environment and Energy.

A referral is not required for proposed actions that may affect nationally listed threatened species, populations, endangered ecological communities and migratory species. Impacts on these matters are still assessed as part of the REF in accordance with Australian Government significant impact criteria and taking into account relevant guidelines and policies.

Factor	Impact
a. Any impact on a World Heritage property? The proposal would not impact on a World Heritage property.	Nil
b. Any impact on a National Heritage place? The proposal would not impact on a National Heritage place.	Nil
c. Any impact on a wetland of international importance? The proposal would not impact on a wetland of international importance.	Nil
d. Any impact on a listed threatened species or communities? The proposal would not impact on listed threatened species or communities	Nil
e. Any impacts on listed migratory species? The proposal would not impact on listed migratory species	Nil
f. Any impact on a Commonwealth marine area? The proposal would not impact on a Commonwealth marine area.	Nil
g. Does the proposal involve a nuclear action (including uranium mining)? The proposal would not involve a nuclear action.	Nil
Additionally, any impact (direct or indirect) on Commonwealth land? The proposal would not impact on Commonwealth land.	Nil

Appendix B

Statutory consultation checklists

Infrastructure SEPP

Council related infrastructure or services

Issue	Potential impact	Yes / No	If 'yes' consult with	ISEPP clause
Stormwater	Are the works likely to have a *substantial* impact on the stormwater management services which are provided by council?	No		ISEPP cl.13(1)(a)
Traffic	Are the works likely to generate traffic to an extent that will *strain* the existing road system in a local government area?	No		ISEPP cl.13(1)(b)
Sewerage system	Will the works involve connection to a council owned sewerage system? If so, will this connection have a *substantial* impact on the capacity of any part of the system?	No		ISEPP cl.13(1)(c)
Water usage	Will the works involve connection to a council owned water supply system? If so, will this require the use of a *substantial* volume of water?	No		ISEPP cl.13(1)(d)
Temporary structures	Will the works involve the installation of a temporary structure on, or the enclosing of, a public place which is under local council management or control? If so, will this cause more than a *minor* or *inconsequential* disruption to pedestrian or vehicular flow?	No		ISEPP cl.13(1)(e)
Road & footpath excavation	Will the works involve more than *minor* or *inconsequential* excavation of a road or adjacent footpath for which council is the roads authority and responsible for maintenance?	No		ISEPP cl.13(1)(f)

Local heritage items

Issue	Potential impact	Yes / No	If 'yes' consult with	ISEPP clause
Local heritage	Is there is a local heritage item (that is not also a State heritage item) or a heritage conservation area in the study area for the works? If yes, does a heritage assessment indicate that the potential impacts to the item/area are more than *minor* or *inconsequential*?	No		ISEPP cl.14

Flood liable land

Issue	Potential impact	Yes / No	If 'yes' consult with	ISEPP clause
Flood liable land	Are the works located on flood liable land? If so, will the works change flood patterns to more than a *minor* extent?	No		ISEPP cl.15

Public authorities other than councils

Issue	Potential impact	Yes / No	If 'yes' consult with	ISEPP clause
National parks and reserves	Are the works adjacent to a national park or nature reserve, or other area reserved under the *National Parks and Wildlife Act 1974*?	No	Office of Environment and Heritage	ISEPP cl.16(2)(a)
Marine parks	Are the works adjacent to a declared marine park under the *Marine Parks Act 1997*?	No	Department of Planning and Environment and Energy	ISEPP cl.16(2)(b)
Aquatic reserves	Are the works adjacent to a declared aquatic reserve under the *Fisheries Management Act 1994*?	No	Office of Environment and Heritage	ISEPP cl.16(2)(c)
Sydney Harbour foreshore	Are the works in the Sydney Harbour Foreshore Area as defined by the *Sydney Harbour Foreshore Authority Act 1998*?	No	Department of Planning and Environment and Energy	ISEPP cl.16(2)(d)
Bush fire prone land	Are the works for the purpose of residential development, an educational establishment, a health services facility, a correctional centre or group home in bush fire prone land?	No	Rural Fire Service	ISEPP cl.16(2)(f)

Appendix C

Traffic and Transport Assessment

Road Construction Pre-cast Facility

CPD Contractors, Dragados & Samsung Joint Venture (CDSJV)

Traffic and Transport Assessment

IA055301.244 | 02

29 November 2016

CH244

Road Construction Pre-cast Facility

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1. Introduction

Roads and Maritime Services (Roads and Maritime) propose to establish and operate a pre-cast facility (the proposal) to support the construction of road projects, including the New M5. The facility would be established and operated on George Booth Drive, Buchanan, in the Cessnock local government area (LGA). The location of the proposal is shown in **Figure 1.1**

The proposal is located on land that previously operated as a pre-cast facility in 2010 to support the construction of the Hunter Expressway project. Minimal site construction works would be required to reinstate the pre-cast facility as the site is already established. Site construction works for the proposal would include:

- Re-instating fencing around the proposal area
- Installing site office facilities
- Inspection of existing facilities including waste water treatment facilities (septic tanks, sand filtration system and sediment basin) and completing any necessary repairs.

The proposal area would be approximately four hectares in size and wholly contained within the previously disturbed and established Hunter Expressway pre-cast facility. The proposal area would accommodate the following facilities:

- Demountable site compound office
- A pre-cast yard, including existing shed for construction of pre-cast units and storage laydown area
- Waste water treatment facilities consisting of septic tanks, sand filtration system and sediment basin
- On-site parking for up to 60 vehicles.

The operation of the site would involve the production of the pre-cast concrete segments and would involve the following activities:

- Receiving concrete deliveries from off-site Daracon concrete batching plant located at Cameron Park (12 deliveries per day)
- Pouring about four pre-cast concrete segments per day
- Despatching pre-cast concrete segments to Sydney (four to six deliveries per day).

When the facility is no longer required to support construction of road projects, the proposal area would be returned to its existing state.

1.1 Purpose of Report

The proposal is being assessed under Part 5 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). This requires the preparation of a Review of Environmental Factors (REF) to facilitate Roads and Maritime to examine and take into account to the fullest extent possible, all matters affecting or likely to affect the environment by reason of the activity. This traffic and transport assessment has been prepared by Jacobs on behalf of Roads and Maritime to assess the impact of the proposal on the existing road network and transport facilities.

1.2 Report structure

This report details the outcomes of the traffic, transport and access assessment. The remainder of this report is structured as follows:

- **Section 2** details the existing transport environment and provides the local context within which the assessment has been undertaken
- **Section 3** details the proposed development, access and traffic generation
- **Section 4** describes the potential traffic impacts
- **Section 5** details mitigation measures
- **Section 6** provides a summary and conclusion.

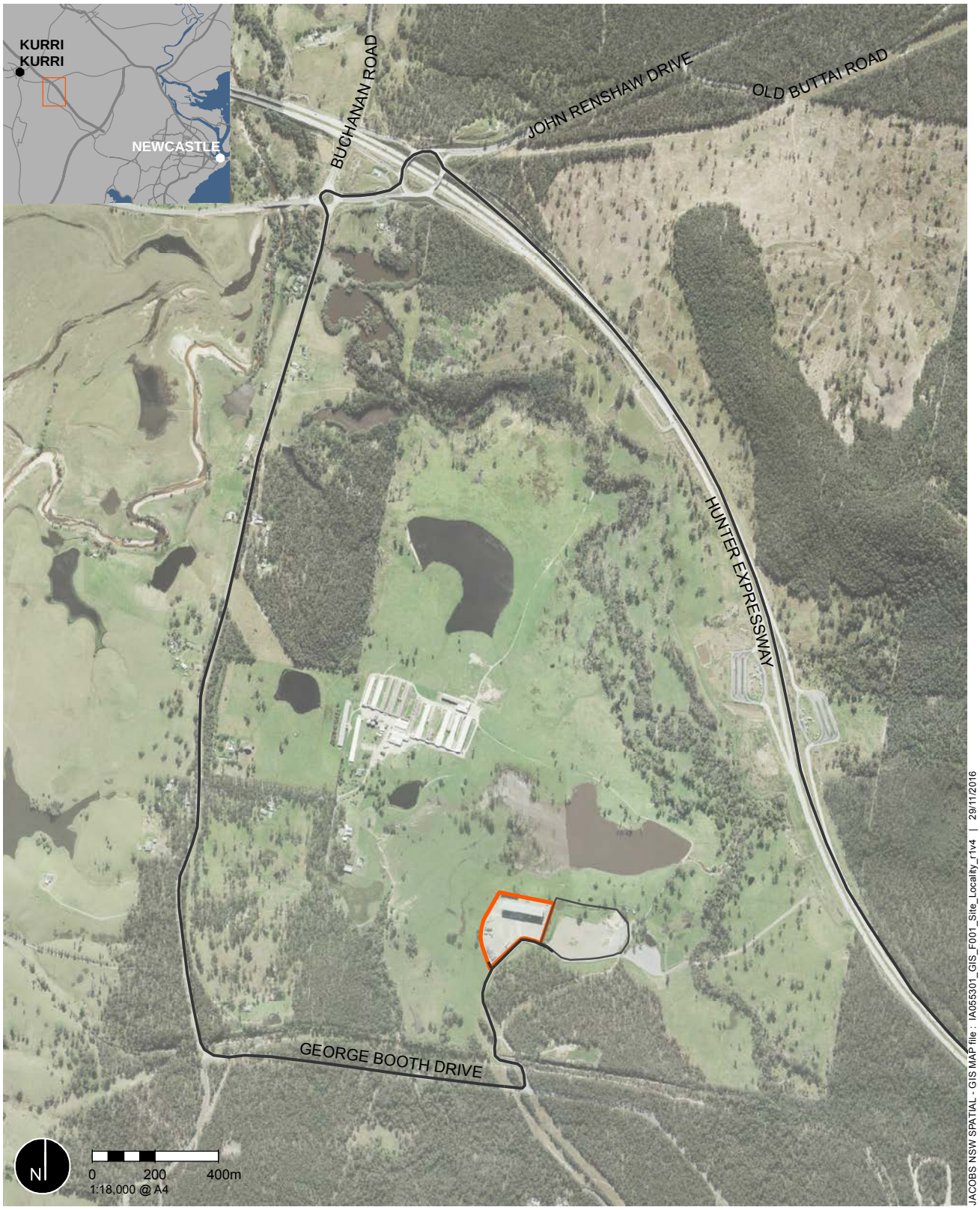


Figure 1-1 | Site locality

2. Existing Conditions

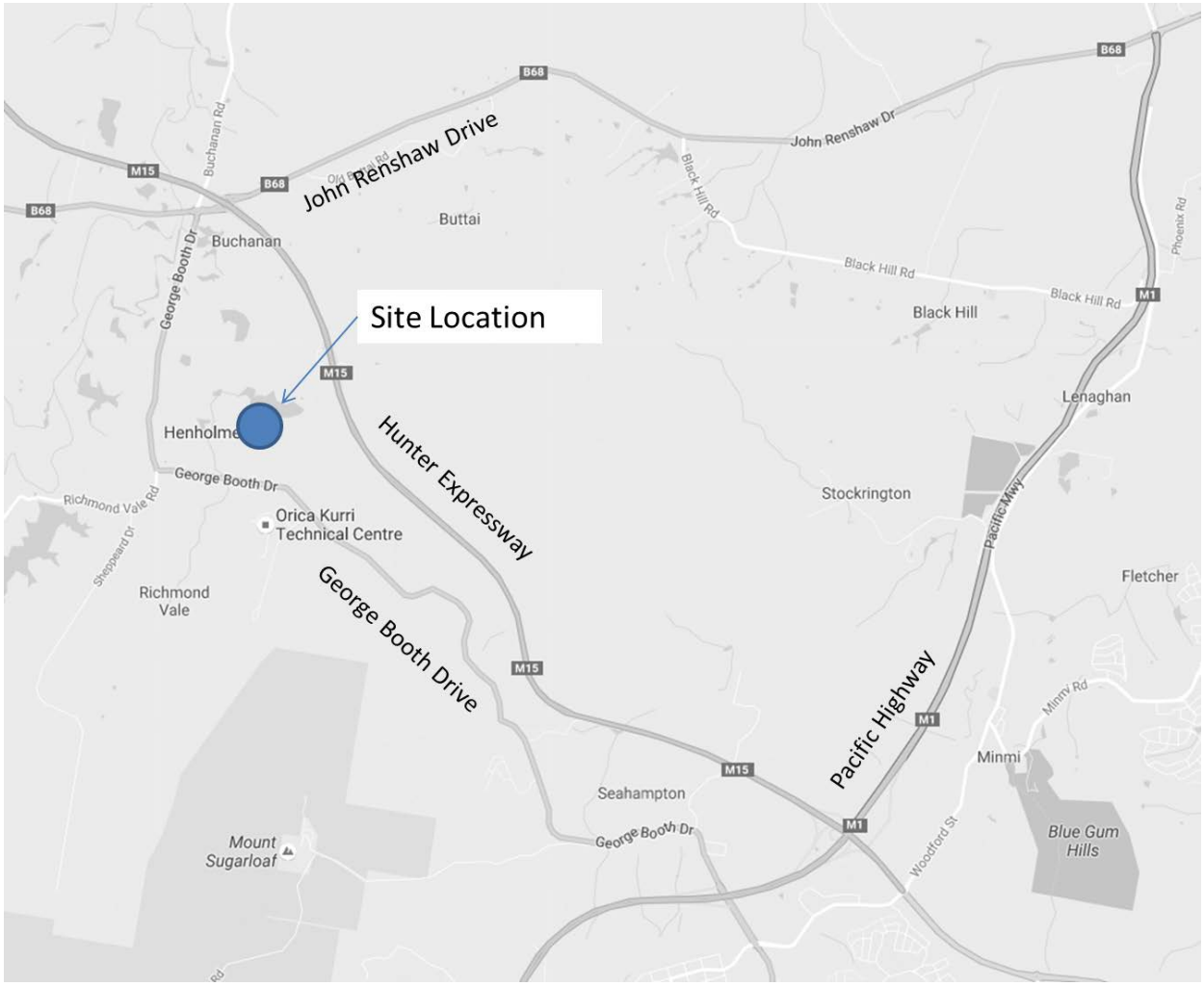
2.1 Site Location

The site is located at Buchanan in the Cessnock City Council local government area, approximately 160 kilometres north-west of Sydney and 30 kilometres west of Newcastle. The access to the site is from George Booth Drive. The area surrounding the site is predominantly undeveloped bushland, industrial and rural farm lands, including poultry farms as shown in Figure 1-1.

2.2 Road Network

At the regional level, the site is situated to the east of the intersection of George Booth Drive and Richmond Vale Road and west of Hunter Expressway. These roads provide connections to the wider road network in the area. The local road network is shown in Figure 2.1.

Figure 2.1: Local Road Network



Key roads in the study area are described below:

- **George Booth Drive** (MR527), as shown in Figure 2.2, is a two-lane two-way rural road that connects John Renshaw Drive (and then the Hunter Expressway) to the north with the Pacific Highway (M1) on south-east. The sign posted speed limit is 80 km/h except on a short section of 60km/h in the vicinity of John Renshaw Drive. The intersection at the site access was upgraded as part of Hunter Expressway

compound site facilitation works. The priority intersection ('Give way') at George Booth Drive can allows turning movements from all directions.

Figure 2.2 : George Booth Drive facing eastbound direction towards the site access

Source: Google map, 2016

- **John Renshaw Drive** (MR 588), as shown in Figure 2.3, is a two-lane rural regional road which connects Maitland Street at Kurri Kurri with the New England Highway to the east at Tarro. The sign posted speed limit is generally 90 km/h in the rural area and 60km/h in the town centres. John Renshaw Drive has major intersections with Hunter Expressway and New England Highway.

Figure 2.3: John Renshaw Drive facing westbound direction towards a roundabout intersection at George Booth Drive

Source: Google map, 2016

- **Hunter Expressway**, shown in Figure 2.4, is a 40 kilometre, four-lane freeway which was opened to traffic on 22 March 2014. This freeway links the M1 Motorway (Pacific Highway) near Seahampton and the New England Highway, west of Branxton. This provides an east-west connection between Newcastle and the Lower Hunter. The access route to the site from Hunter Expressway is provided via a roundabout intersection at John Renshaw Drive. The opening of Hunter Expressway has resulted in a substantial reduction of traffic on George Booth Drive.

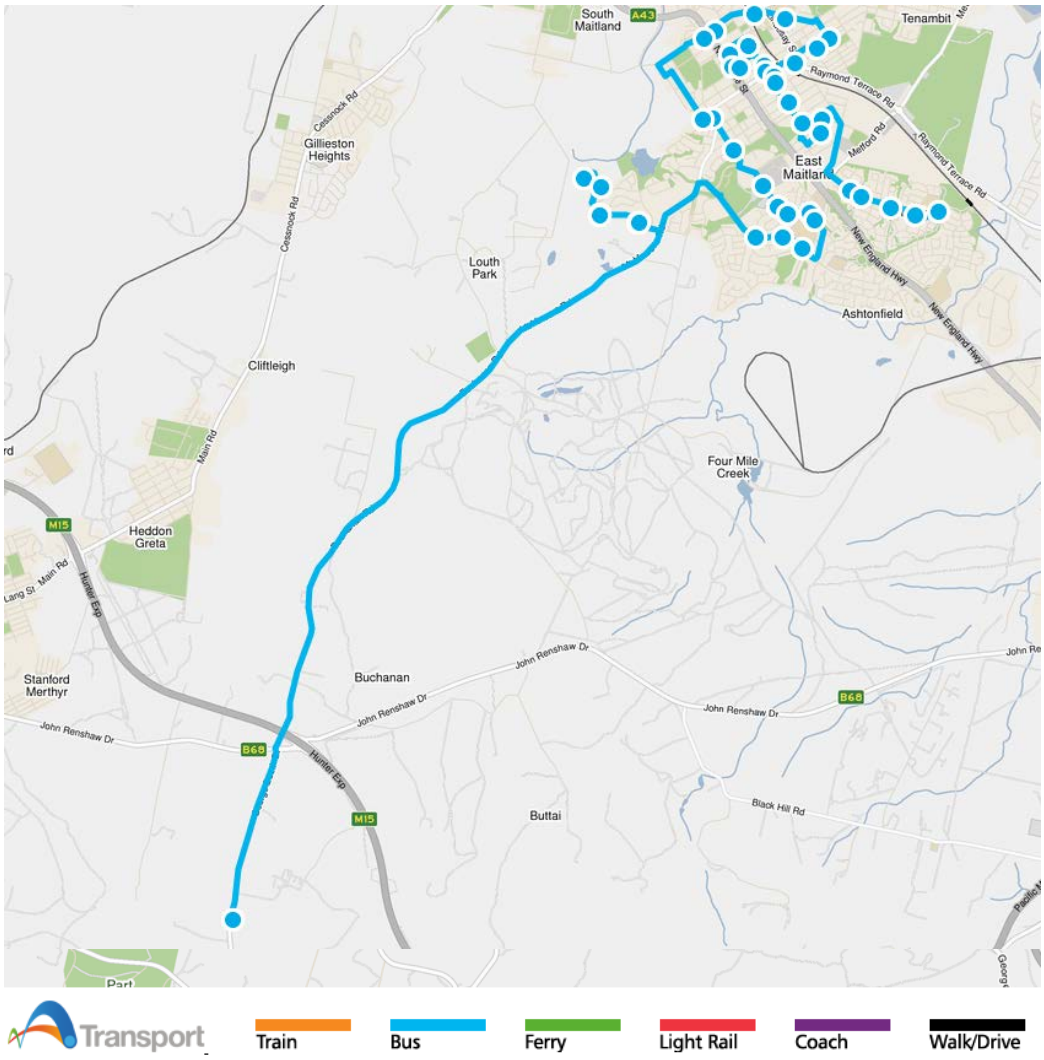
Figure 2.4 : Hunter Expressway facing eastbound direction

Source: Google map, 2016

2.3 Public Transport

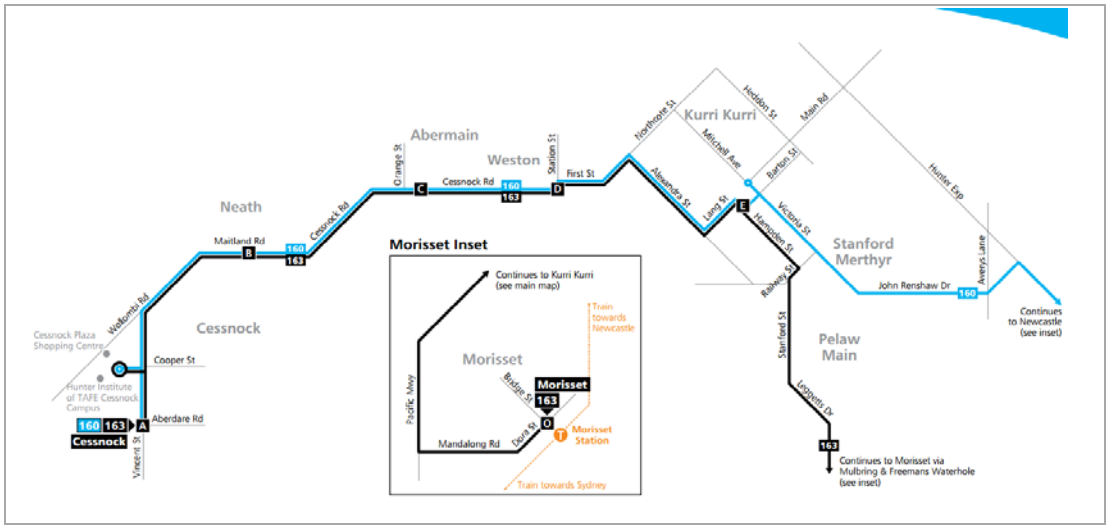
There are few public transport services that operate near the site on George Booth Drive. Route 2521- Buchanan to Metford Public School, is a school bus that is operated by Hunter Valley Buses, which runs in the north-south direction on George Booth Drive as indicated in Figure 2.5. Route 160 and 163 (Rover Coaches) operate from Cessnock via Kurri Kurri and John Renshaw Drive, but do not provide direct connection to the site (Figure 2.6).

Figure 2.5 : Bus map for route 2835 for school bus



Source: Hunter Buses, 2016

Figure 2.6 : Bus map for routes 160 and 163

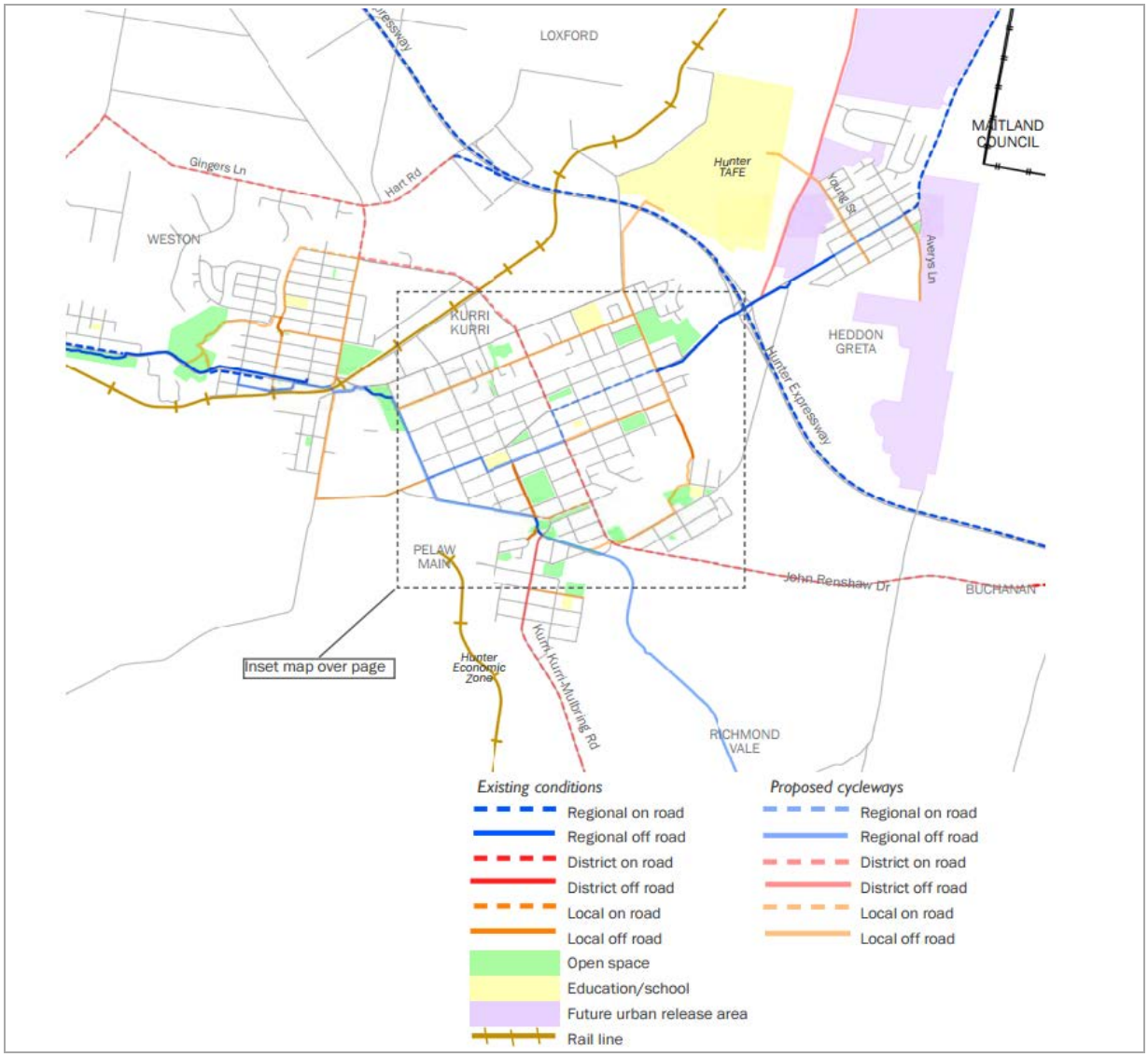


Source: Rover Coaches, 2016

2.4 Active Transport

There are no cycling and walking facilities in the vicinity of the site due to the rural nature of the site. According to Cessnock Council Cycle network map; John Renshaw Drive is identified as a proposed on-road cycleway route (Figure 2.7).

Figure 2.7: Cycle network in the study area

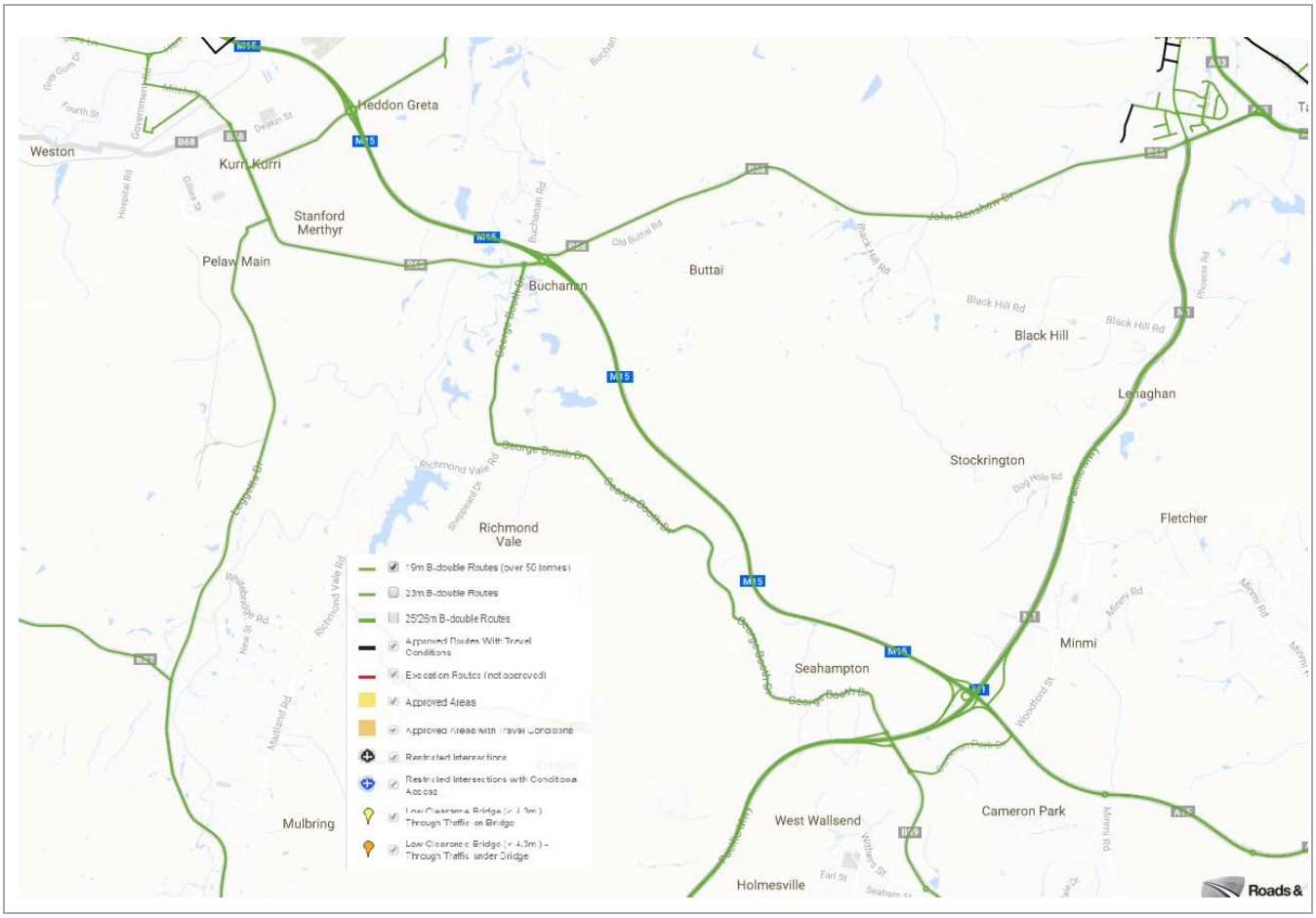


Source: Cessnock City Council, 2016

2.5 Heavy vehicle routes

Roads in the vicinity of the site, such as George Booth Drive, John Renshaw Drive and Hunter Expressway are the approved routes for 26m B-Doubles and 4.6m high vehicles. Figure 2.8**Error! Reference source not found.** shows the approved B-Double routes through the study area.

Figure 2.8 : Approved B-Doubles routes in the study area



Source: NSW Roads and Maritime Services, 2016

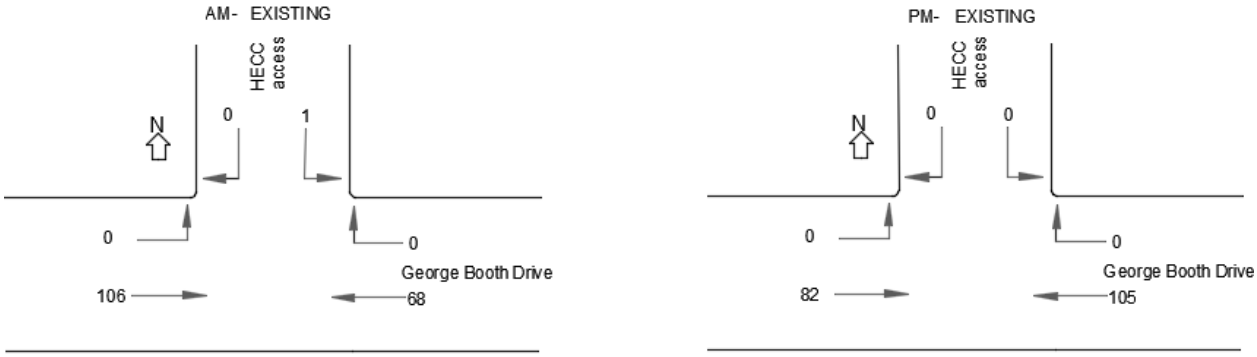
2.6 Existing Traffic Volumes

Peak hour intersection counts were undertaken on George Booth Drive at the site access road on 25 October 2016. George Booth Drive currently carries the following traffic volumes:

- 106 (2% heavy vehicles) vehicles in the eastbound direction and 68 (1% heavy vehicles) vehicles on westbound direction during the morning peak hour, and
- 105 (6% heavy vehicles) vehicles in the westbound direction and 83 (7% heavy vehicles) vehicles on eastbound direction during the evening peak hour.

Figure 2.9 presents the existing traffic volumes on George Booth Drive at the site access point.

Figure 2.9: Existing peak hour traffic volumes



Traffic volumes on George Booth Drive are assumed to have dropped significantly since the opening of the Hunter Expressway in 2014.

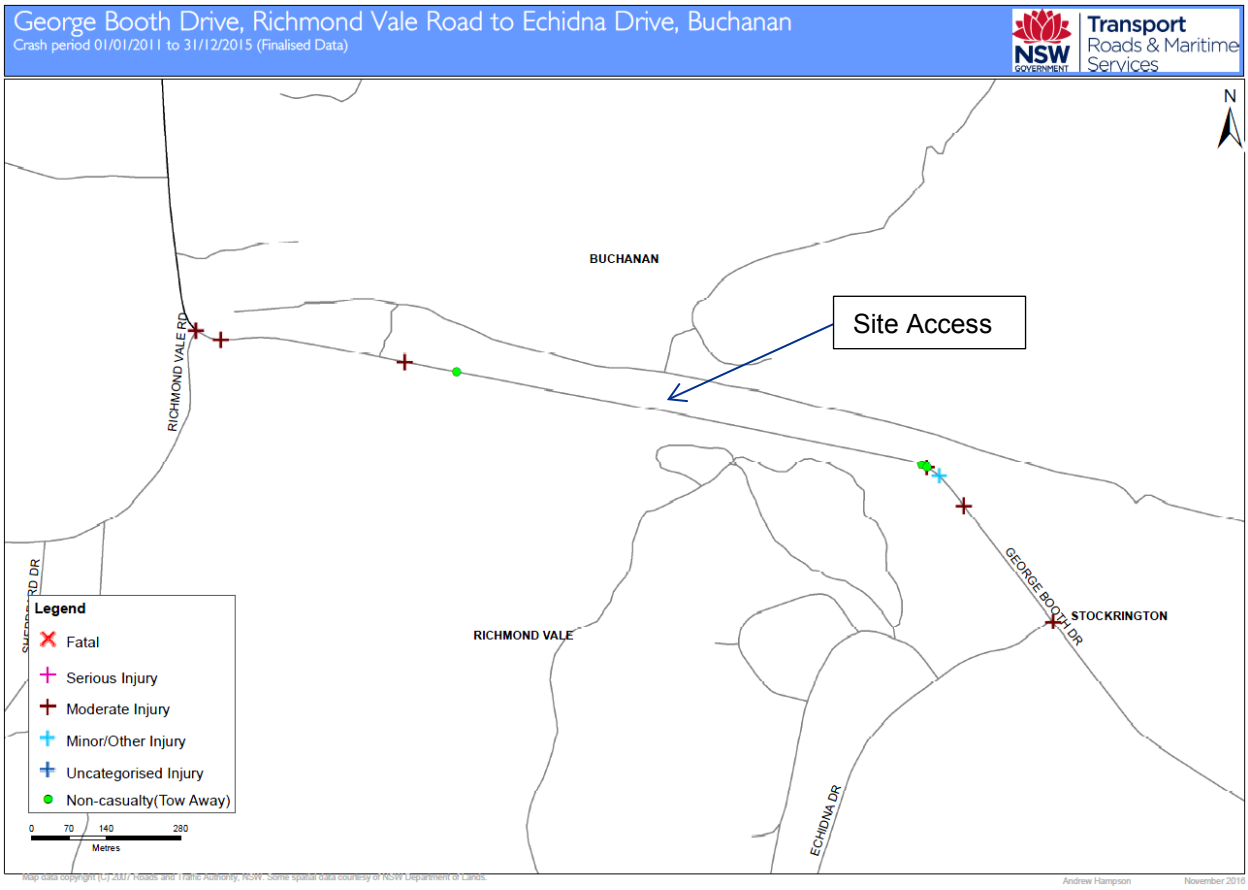
2.7 Crash History

A crash history analysis of the study area has been undertaken using Roads and Maritime's crash statistics data. The data covers George Booth Drive between Richmond Vale Road and Echidna Drive for five years from January 2011 to February 2015. The data shows that:

- There were a total of 13 crashes (2.6 per year).
- Of these none were fatal, ten involved injury crashes.
- 69 % of these crashes were non intersection related and the majority were off-carriageway type crashes.
- Two of these crashes were the result of vehicles hitting an animal.

There were no intersection related crashes occurred at the site access point / George Booth Drive. Figure 2.10 shows the crash map with location details.

Figure 2.10: Crash Locations (2011 – 2015)



Source: Centre for Road Safety

Since the opening of the Hunter Express way traffic volumes have decreased and therefore the crash rate is likely to have decreased accordingly.

3. Proposed Development

3.1 Description of Proposed Use

Roads and Maritime propose to establish and operate a pre-cast facility (the proposal) to support construction of the road projects in particular the New M5. The facility would be established and operated on a site previously used as a pre-cast facility for the Hunter Expressway project, on George Booth Drive, Buchanan in the Cessnock LGA.

Construction works for the proposal would include:

- Re-instating fencing around the proposal area
- Installing site office facilities
- Inspection of existing facilities including waste water treatment facilities (septic tanks, sand filtration system and sediment basin) and completing any necessary repairs.

The operation of the site would involve the production of the pre-cast concrete segments and would involve the following activities:

- Receiving concrete deliveries from off-site concrete batching plant located at Cameron Park (12 deliveries per day)
- Pouring four pre-cast concrete segments per day
- Despatching pre-cast concrete segments to Sydney (four to six deliveries per day).

The constructed pre-cast components will be dispatched to Sydney, which is approximately 220 kilometres away from the facility. The Transport Management Plan for the haul route for over-sized vehicles has been prepared by a transportation company, REXJ Andrews Engineered Transportation., which is provided in Appendix B.

When the facility is no longer required to support construction of road projects, the proposal area would be returned to its existing state.

The site traffic movements would include:

- Staff access
- Supplies of raw materials, steel etc.
- Concrete trucks
- Oversized haulage vehicles.

3.2 Access

Access to the site will be from George Booth Drive via the access road to the site. The width of the access road is approximately 10 meters wide and would easily allow two trucks to pass. The access road intersection was upgraded as part of the Hunter Expressway construction site access works. This priority controlled intersection at George Booth Drive would able to accommodate the turning movements for both east and westbound construction related vehicles. Figure 3.1 shows the site access intersection.

Figure 3.1 : Priority controlled access at George Booth Drive

Source: Google map, 2016

3.3 Traffic Generation

3.3.1 Existing

Peak hour intersection counts were undertaken on George Booth Drive at the site access road on 25 October 2016. The morning peak hour occurred between 7.30am – 8.30am and evening peak hour is between 3.45pm – 4.45pm. George Booth Drive currently carries 106 vehicles (2% heavy vehicles) on east bound direction during morning peak hour and 105 vehicles (6% heavy vehicels) on westbound direction during evening peak hour (Table 3.1).

There was no traffic turning into or out of the site during the peak hours. Table 3.1 indicates the existing traffic volumes at the site's location.

Table 3.1: Existing traffic volume

Peak	Existing Traffic Movements		
	Eastbound traffic (veh/hr)	Westbound traffic (veh/hr)	Existing Total Trips (veh/hr)
AM Peak Hour (7.30 – 8.30 am)	106	68	174
PM Peak Hour (3.45 – 4.45 pm)	83	105	189

Source: Jacobs, 2016

3.3.2 Estimated future traffic generation

It is assumed that the proposed use of the site will involve three stages:

- Stage 1: Site establishment
- Stage 2: Operation of the site
- Stage 3: Site decommissioning

It is expected that the site would be operational for three and a half years. The assumptions used for construction staging are based on the information provided by the client and it is detailed as shown in Table 3.2.

It is assumed that:

- establishment and operation of the site would occur during standard construction hours:
    - Monday to Friday: 7.00am to 6.00pm
    - Saturday: 8.00am to 1.00pm
    - No work on Sundays or Public Holidays.
- The maximum number of construction related staff and heavy vehicle movements occur during the operational stage, Stage 2.
- It is assumed that proposal would generate approximately 42 heavy vehicles movements and 100 light vehicles movements per day during Stage 2. Majority of heavy vehicles would be concrete trucks and delivery trucks.
- It is assumed that most light vehicles would arrive at the site during morning peak hour and depart the site during evening peak hour.
- Heavy vehicle movements would be more dispersed throughout the day.
- The dispatch of pre-cast components would be carried out outside standard construction hours to facilitate delivery through Sydney to the St Peters Interchange under low traffic volume conditions (12.00 am and 5.00 am daily)

The estimated number of vehicle movements during each stage is shown in **Table 3.2**.

Table 3.2: Daily construction vehicle movements

Construction stage	Construction activities	Vehicle types	Estimated number of movements
Stage 1	Site establishment. This stage involves the following: • transporting equipment to site • re-instating fencing around the proposal area • installing demountable site compound office • inspection of existing facilities including waste water treatment facilities (septic tanks, sand filtration system and sediment basin) and completing any necessary repairs	semi-trailers, cranes, truck and dogs, pick-ups, light vehicles etc.	33 heavy vehicles – entering the site - in a week, and 50 light vehicles-daily
Stage 2	This stage is the major stage of the works, which would involve the production of the pre-cast concrete segments and would involve the following activities: • Receiving concrete deliveries from off-site Daracon Concrete batching Plan located at Cameron Park (12 deliveries per day) • Pouring about four pre-cast concrete segments per day • Despatching pre-cast concrete segments to St Peters (four to six deliveries per day).	Light vehicles, pickups, utilities, van concrete trucks, semi-trailers, truck and dogs, light vehicles etc.	100 light vehicles-daily 42 heavy vehicles - daily
Stage 3	This stage would involve decommissioning the site to its pre-New M5 use state and would	semi-trailers, cranes, truck and	33 heavy vehicles - departing the site - in

Construction stage	Construction activities	Vehicle types	Estimated number of movements
	involve the following activities: • Removal of CDS JV site office, plant and equipment.	dogs, pick-ups, light vehicles etc.	the last week, and 50 light vehicles-daily

Source: Jacobs, 2016

The estimated number of construction vehicle movements during each stage in the morning and evening peak hours is detailed in Table 3.3.

Table 3.3: Peak hour construction related vehicle movements

Stages	Morning Peak Hour				Evening Peak Hour			
	Light Vehicles		Heavy Vehicles / Delivery Vehicles		Light Vehicles		Heavy Vehicles / Delivery Vehicles	
	Inbound	Outbound	Inbound	Outbound	Inbound	Outbound	Inbound	Outbound
Stage 1	20	5	6	4	5	25	2	4
Stage 2	45	5	11	10	5	45	10	11
Stage 3	20	5	6	4	5	25	2	4

Source: Jacobs, 2016

During Stage 1, mobilisation of the machinery, deliveries of site establishment equipment and site establishment works would occur. It is assumed that this would result in approximately 10 heavy vehicles and 25 light vehicles enter / exit the site during the peak hour periods.

Stage 2 would result in approximately 100 light vehicle movements and 42 heavy vehicle movements daily. During morning and evening peak hour it is assumed that approximately 50 light vehicles and 21 heavy vehicles trips would occur. The heavy vehicle would include concrete delivery trucks from Daracon Concrete Batching Plant located at Cameron Park (12 deliveries per day).

During Stage 3 works, demobilisation of the machineries, plant, equipment and removal of the site office would occur. In this stage, it is assumed that this would result in approximately 10 heavy vehicles and 30 light vehicles enter the site during the morning peak period.

The additional traffic generated during the construction periods represents an increase of up to 71 vehicles during morning and evening peak hours and these are not expected to have any significant impacts on road safety on George Booth Drive and surrounding road network. The existing turning bays at the site's access point and George Booth Drive are considered suitable to accommodate the turning vehicles, inducing the heavy vehicles into the site.

For the analysis it was assumed that 70 percent of traffic leave or arrive from the west on George Booth Drive and 30 percent leave or arrive to the east.

4. Assessment of Traffic Impacts

4.1 Intersection Performance

In order to determine the traffic impacts at the intersection of George Booth Drive and the site access point during the morning (AM) and evening (PM) peak hour, intersection analysis using SIDRA Intersection software (ver 6.1) has been undertaken. In the analysis, existing traffic volumes have been on the basis of intersection counts.

The criteria for evaluating the operational performance of intersections are based on *Guide to Traffic Generating Developments (Roads and Maritime 2002*). Level of Service (LoS) is the standard qualitative measure used to understand the operational efficiency of intersections. LoS ranges from A to F. The LoS between A and D indicate the intersection is operating within capacity with LoS A indicates very good performance and LoS D indicates satisfactory performance. LoS E and F indicate the intersection is operating at or over capacity. This is an indication that the intersection would require improvement works to maintain reasonable performance. Table 4.1 summarises the LoS definitions.

Table 4.1: **Level of Service (LoS) Definitions**

Level of Service	Average Delay per Vehicle (sec)	Traffic Signals. Roundabouts	Give way & Stop Signs
A	<14	Good operation	Good operation
B	15 to 28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Operating near capacity	Near capacity & accident study required
E	57 to 70	At capacity; incidents will cause excessive delays at signals Roundabouts require other control modes	At capacity, requires other control mode
F	>70	Over Capacity; unstable operation	Over capacity; unstable operation.

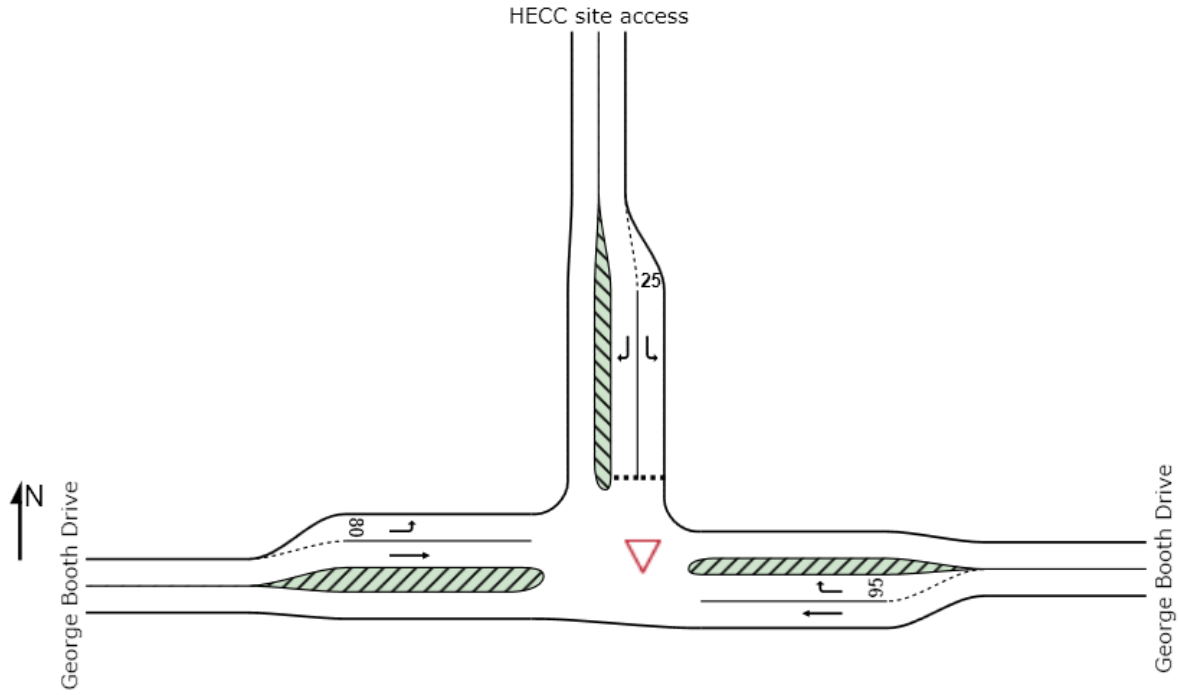
Source: RTA Guide to Traffic Generating Developments (2002)

The existing and the proposed traffic scenarios have been modelled to determine the operational performance of the intersection and as follows:

- Existing Scenario- with existing (2016) traffic counts
- Proposed Scenario- with the site operation (major stage- Stage 2)

The existing configuration of the intersection of George Booth Drive and the site access point as illustrated in Figure 4.1.

Figure 4.1 : Intersection configuration of George Booth Drive / site access



Source: Jacobs, 2016

The modelling results are summarised in Table 4.2. Please note that for priority intersections the intersection performance is based on the worst performing movement.

The results of the intersection analysis for existing and proposed scenarios are shown in .Full model outputs are presented in Appendix A for Existing and Proposed modelling scenarios.

Table 4.2 : Performance of existing and future scenario models in, AM peak hours

Period	Approach	Total vehicles	DoS	Average delay (seconds)	LoS	95% back of queue (metres)
AM Peak – 2016 existing	George Booth Drive - east leg	73	0.04	0.10	A	0.0
	Site access- North leg	2	0.001	5.3	A	0.0
	George Booth Drive - west leg	113	0.058	3.2	A	0.0
	Worst movement	**187**	**0.058**	**7.2**	**A**	**0.0**
AM peak – Proposed	George Booth Drive - east leg	95	0.037	1.9	A	0.7
	Site access- North leg	16	0.011	5.5	A	0.3
	George Booth Drive - west leg	147	0.058	4.2	A	0.0
	Worst movement	**258**	**0.058**	**7.1**	**A**	**0.7**
PM Peak – 2016 existing	George Booth Drive - east leg	112	0.059	0.1	A	0.0
	Site access- North leg	2	0.001	5.3	A	0.0
	George Booth Drive - west leg	87	0.046	3.2	A	0.0
	Worst movement	**201**	**0.059**	**7.8**	**A**	**0.0**
PM peak – Proposed	George Booth Drive - east leg	77	0.037	0.5	A	0.1
	Site access- North leg	75	0.055	5.8	A	1.7
	George Booth Drive - west leg	122	0.058	3.5	A	0.0
	Worst movement	**274**	**0.058**	**7.7**	**A**	**1.7**

Source: Jacobs, 2016

The modelling results of the existing and proposed conditions at the site access point and George Booth Drive indicates that the intersection will continue to operate at LoS A in both morning and evening peak hours with very minor delays.

Therefore, the traffic generated during the Stage 2 the peak of the construction works would have minimal impact on the capacity of George Booth Drive.

4.2 Heavy Vehicles Routes

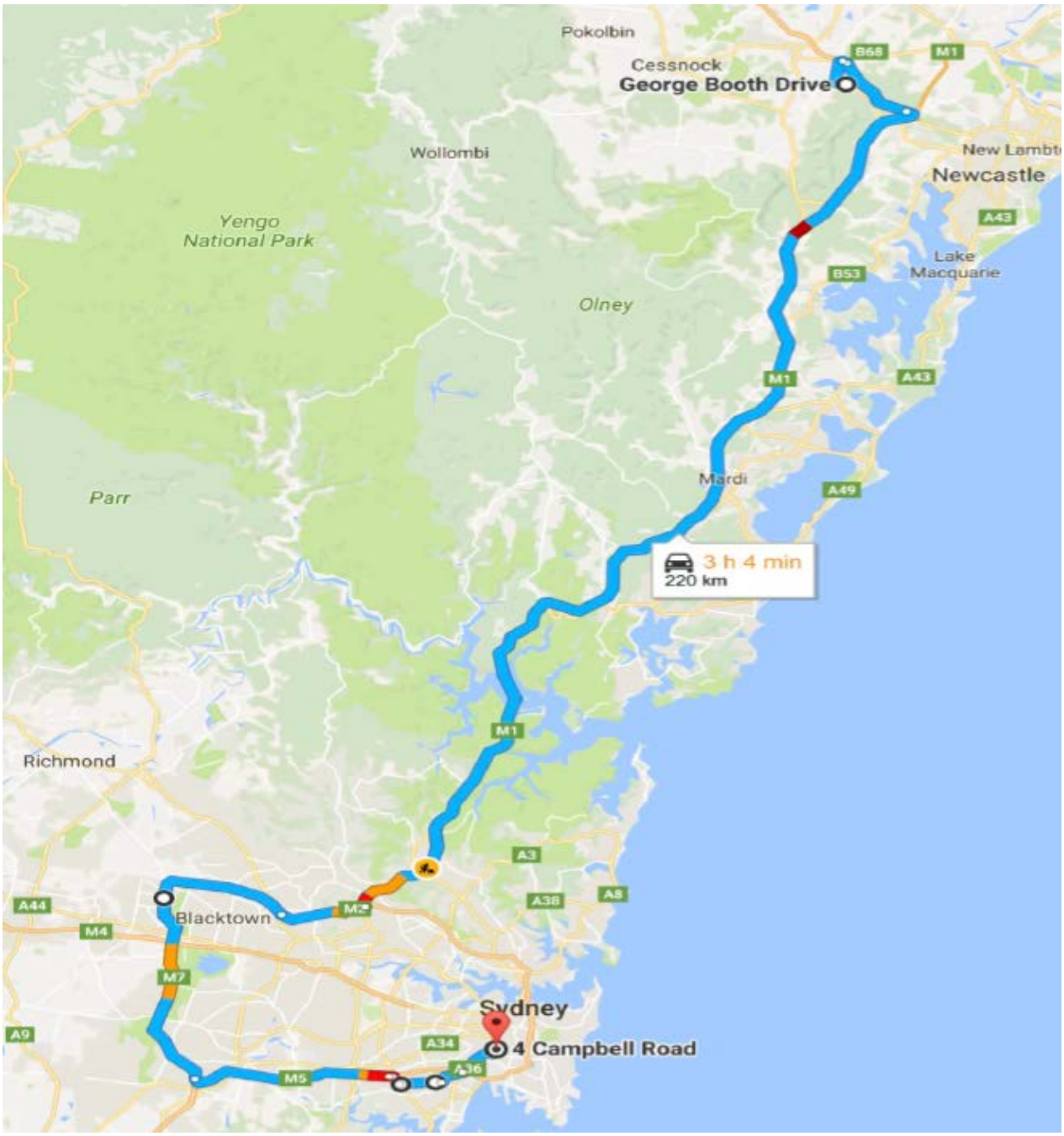
4.2.1 Oversized Vehicles

The oversized and over-mass load haulage route for the delivery of the precast concrete components from the site in Buchanan to St Peters in Sydney would be via via George Booth Dr, John Renshaw Drive, Hunter Expressway, Pacific Highway, M1 Motorway, Pennant Hills Road, M2 Motorway, M7 Motorway, M5 Motorway, King Georges Road, Stoney Creek Road, Forest Road, Princes Highway, Canal Road, Burrows Road and Campbell Road. The oversize loads are planning to travel on these routes between 12.00 am and 5.00 am daily.

The Transport Management Plan and haulage route studies have been undertaken by a transportation company, REXJ Andrews Engineered Transportation. Haulage route map is shown in Figure 4.2.

Appendix B shows the Transport Management Plan with haulage routes.

Figure 4.2 : Haulage route for concrete panel delivery to St Peters site

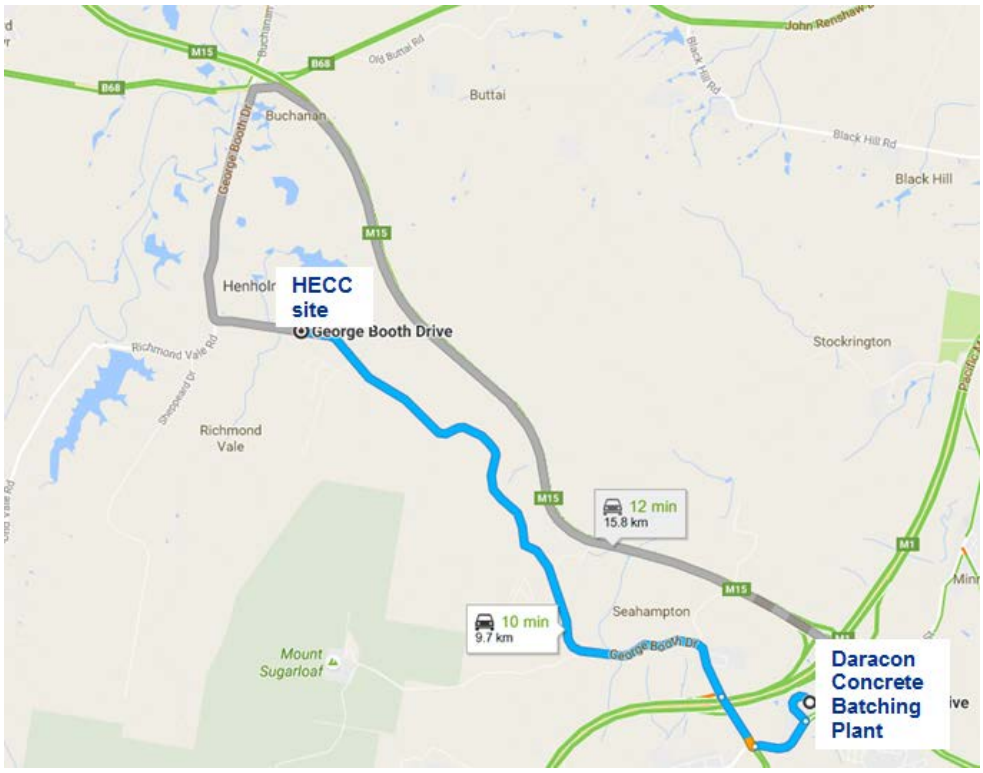


Source: Transport Management Plan by REXJ Andrews Engineered Transportation, 2016

4.2.2 General Heavy Vehicle Routes

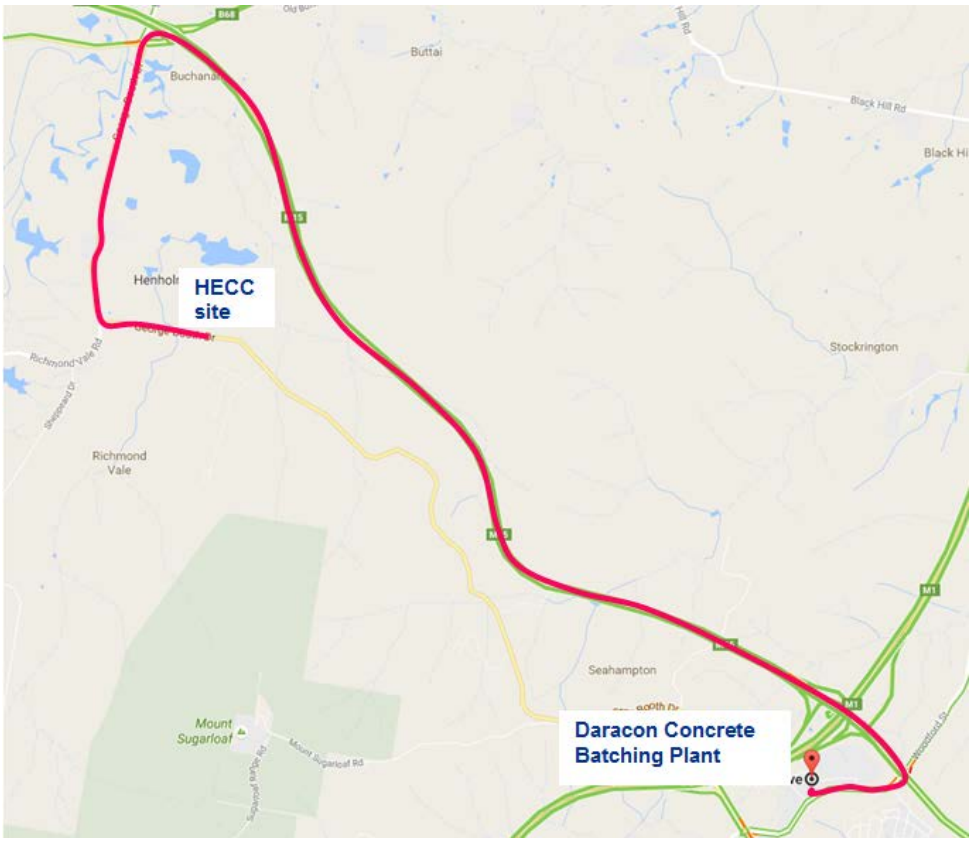
Stage 2 of the construction phase will be when most of the heavy vehicle movements will occur. This has been estimated as 42 heavy vehicle movements daily (21 heavy vehicles in both morning peak and evening peak hours). This would represent approximately 88 percent increase in heavy vehicle volumes on George Booth Drive during the morning peak hour and 64 percent increase in the evening peak hour. The heavy vehicles trips would include trips of concrete delivery trucks from Daracon Concrete Batching Plant located at Cameron Park (12 deliveries per day). The route options for the concrete delivery trucks are as shown in Figure 4.3 and Figure 4.4.

Figure 4.3 : Concrete delivery trucks route from Daracon Batching Plant – Option 1



Source: Google maps, 2016

Figure 4.4 : Concrete delivery trucks route from Daracon Batching Plant – Option 2



Source: Google maps, 2016

Given the existing low traffic volumes of the heavy vehicles in the peak periods, these increases in vehicle movements are not expected to impact on the operation of the adjacent road network (refer to Table 4.2 for the modelling results).

4.3 Cumulative Impacts

No significant developments have been identified in the vicinity that would have a cumulative impact. The traffic generated by the site would impact primarily on George Booth Drive, Hunter Expressway, John Renshaw Drive and Cessnock Road. Slightly higher than normal vehicle movements would likely occur on these roads but is unlikely to cause any significant impacts.

4.4 Public and Active Transport

There are no bus routes along east-west direction of George Booth Drive. There are no formal footpaths and cycle facilities are provided along George Booth Drive and within the study area. As such, the construction works would have minimal impact on public and active transport facilities.

4.5 Parking

On-site parking for approximately 50 to 60 vehicles would be provided on site, resulting in no impact on the provision of on-street car parking.

4.6 Road Safety

The majority of the construction related trips would be travelling outside peak hours and it is anticipated that this would reduce the potential for vehicle conflicts during busy periods. The upgraded priority-controlled intersection at George Booth Drive access would provide opportunities for making right hand turns onto and off the site's access road with reduced delays. This would reduce the potential conflicts with the general traffic travelling along George Booth Drive.

The modelling results of the intersection of George Booth Drive and site's access road indicates that the intersection performs with very minor delays and Level of Service A during both morning and evening peak periods.

The review of the five year period crash data does not indicate any intersection related crashes at the site access point / George Booth Drive. 69 % of the crashes were non intersection related (mainly due to speeding) and therefore no specific remedial treatment is required along George Booth Drive in the vicinity of the site.

The intersection of the site access road and George Booth Drive has been designed with deceleration lanes and turn bays and should minimise the risk of rear end type crashes. Given the low traffic volumes of the construction vehicles, low crash history in the area and the good operational performance of the intersection at the site access point, the increases in vehicle movements at this location are not expected to significantly impact the road safety.

5. Mitigation Measures

The proposed operation of the site is unlikely to cause any significant impacts on the road network and local amenity. The site has previously been used for a similar purpose and since then traffic volumes on George Booth Drive have reduced as a result of the opening of the Hunter expressway in 2014. The intersection of the site access road and George Booth Drive has been designed to accommodate heavy vehicles and modelling forecasts that it would operate at good levels of service.

Movement of oversized vehicles will be restricted to late nights and subject to the traffic management plan. It is recommended that local land holders are notified of the proposed activity at the site.

6. Conclusion

Roads and Maritime Services (Roads and Maritime) propose to establish and operate a pre-cast facility (the proposal) to support the construction of road projects, including the New M5. The facility would be established and operated on George Booth Drive, Buchanan, in the Cessnock local government area (LGA). The site was previously used for the same purpose during the construction of the Hunter Expressway. Since the opening of the Hunter Expressway in 2014 traffic volumes on George Booth Drive have decreased.

It is estimated that the site would generate some 50 light vehicle trips and 25 heavy vehicle trips during the peak traffic periods.

The findings of the study were:

- Given the existing and forecast low traffic volumes, low crash history in the area, good operational performance of the intersection at the site access road, the increases in vehicle movements at this location are not expected to impact on the road safety and operation of the adjacent road network.
- The intersection of the access road and George Booth Drive is forecast to operate at Level of Service 'A' during operation.
- Heavy vehicle routes have been identified and will use designated heavy vehicle routes suitable for B-Double trucks.
- Oversized vehicle movements will be subject to a traffic management plan and use the roads at night 12:00am (midnight) to 5:00am.

The proposed re-establishment of the site is unlikely to cause any significant traffic or transport impacts.

Appendix A. SIDRA Modelling Outputs

Site: AM Existing_ George Booth Dr / Site access

New Site
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
East: George Booth Drive											
5	T1	72	1.0	0.037	0.0	LOS A	0.0	0.0	0.00	0.00	80.0
6	R2	1	0.0	0.001	7.2	LOS A	0.0	0.0	0.21	0.56	53.8
Approach		73	1.0	0.037	0.1	NA	0.0	0.0	0.00	0.01	79.4
North: site access											
7	L2	1	0.0	0.001	4.9	LOS A	0.0	0.0	0.20	0.48	53.6
9	R2	1	0.0	0.001	5.6	LOS A	0.0	0.0	0.31	0.50	53.1
Approach		2	0.0	0.001	5.3	LOS A	0.0	0.0	0.26	0.49	53.3
West: George Booth Drive											
10	L2	1	0.0	0.001	6.9	LOS A	0.0	0.0	0.00	0.63	65.4
11	T1	112	2.0	0.058	3.2	LOS A	0.0	0.0	0.00	0.42	73.2
Approach		113	2.0	0.058	3.2	NA	0.0	0.0	0.00	0.42	73.1
All Vehicles		187	1.6	0.058	2.0	NA	0.0	0.0	0.00	0.26	75.1

Site: PM Existing_ George Booth Dr / Site access

New Site
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
East: George Booth Drive											
5	T1	111	7.0	0.059	0.0	LOS A	0.0	0.0	0.00	0.00	80.0
6	R2	1	0.0	0.001	7.1	LOS A	0.0	0.0	0.18	0.57	53.9
Approach		112	6.9	0.059	0.1	NA	0.0	0.0	0.00	0.01	79.6
North: site access											
7	L2	1	0.0	0.001	4.8	LOS A	0.0	0.0	0.17	0.48	53.7
9	R2	1	0.0	0.001	5.8	LOS A	0.0	0.0	0.33	0.50	53.1
Approach		2	0.0	0.001	5.3	LOS A	0.0	0.0	0.25	0.49	53.4
West: George Booth Drive											
10	L2	1	0.0	0.001	6.9	LOS A	0.0	0.0	0.00	0.63	65.4
11	T1	86	6.0	0.046	3.2	LOS A	0.0	0.0	0.00	0.41	72.0
Approach		87	5.9	0.046	3.2	NA	0.0	0.0	0.00	0.42	71.9
All Vehicles		201	6.4	0.059	1.5	NA	0.0	0.0	0.00	0.19	75.7

Site: AM Proposed_ George Booth Dr / Site access

New Site
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
East: George Booth Drive											
5	T1	72	1.0	0.037	0.0	LOS A	0.0	0.0	0.00	0.00	80.0
6	R2	23	20.0	0.021	7.8	LOS A	0.1	0.7	0.27	0.59	53.3
Approach		95	5.6	0.037	1.9	NA	0.1	0.7	0.06	0.15	71.2
North: site access											
7	L2	12	20.0	0.011	5.2	LOS A	0.0	0.3	0.21	0.50	49.3
9	R2	4	20.0	0.006	6.5	LOS A	0.0	0.2	0.37	0.54	48.5
Approach		16	20.0	0.011	5.5	LOS A	0.0	0.3	0.25	0.51	49.1
West: George Booth Drive											
10	L2	36	20.0	0.022	7.3	LOS A	0.0	0.0	0.00	0.63	59.2
11	T1	112	2.0	0.058	3.2	LOS A	0.0	0.0	0.00	0.42	73.2
Approach		147	6.4	0.058	4.2	NA	0.0	0.0	0.00	0.47	69.2
All Vehicles		258	6.9	0.058	3.4	NA	0.1	0.7	0.04	0.35	68.2

Site: PM Proposed_ George Booth Dr / Site access

New Site
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
East: George Booth Drive											
5	T1	72	1.0	0.037	0.0	LOS A	0.0	0.0	0.00	0.00	80.0
6	R2	5	20.0	0.005	7.7	LOS A	0.0	0.1	0.23	0.58	53.3
Approach		77	2.3	0.037	0.5	NA	0.0	0.1	0.02	0.04	77.3
North: site access											
7	L2	33	20.0	0.030	5.2	LOS A	0.1	0.9	0.21	0.51	49.3
9	R2	42	20.0	0.055	6.3	LOS A	0.2	1.7	0.35	0.57	48.6
Approach		75	20.0	0.055	5.8	LOS A	0.2	1.7	0.29	0.54	48.9
West: George Booth Drive											
10	L2	11	20.0	0.006	7.3	LOS A	0.0	0.0	0.00	0.63	59.2
11	T1	112	2.0	0.058	3.2	LOS A	0.0	0.0	0.00	0.42	73.2
Approach		122	3.6	0.058	3.5	NA	0.0	0.0	0.00	0.43	71.8
All Vehicles		274	7.7	0.058	3.3	NA	0.2	1.7	0.08	0.35	64.8

Appendix B. Transport Management Plan for Over-Dimensional Vehicle Movements

REX J ANDREWS
ENGINEERED TRANSPORTATION

TRANSPORT MANAGEMENT PLAN:
CDSJV:
BUCHANAN TO ST PETERS

29/09/2016 REV 00

Rev.	Date	Change	Responsible	Checked
00	29/09/16	Route Scoped	M Sciberras	✓
00	29/09/16	Report compiled	W Andrews	✓
00	29/09/16	Report completed	W Andrews	✓

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INDEX: 2

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1.0 Introduction

This document describes observations and previous experience on route and explains the Transport of concrete segments from Buchanan to St Peters.

This Route study took place on 29/09/16.

2.0 Evaluation

1	No Cost
2	Some Work
3	Urgent Modification
4	Extreme Amount of Work

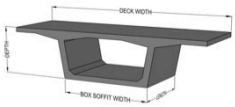
(Mark below boxes with an X)

		1	2	3	4
A	Harbour	**N/A**			
B	Road Modification	**X**			
C	Road Furnishings	**X**			
D	Trees	**X**			
E	Site Entrance	**X**			
F	Bridge Calculations		**X**		
G	Traffic Control	**X**			

3.0 Project data.

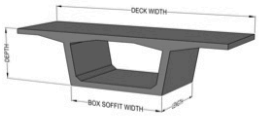
Date of latest Route Study. 29/09/2016
Survey undertaken by. (Rex J Andrews P/L)
Project name. WestConnex New M5
Location. Buchanan NSW to St Peters NSW Australia

4.0 Segment type and size.



QTY	Deck Width (m)	Box Soffit Width (m)	Max Depth (m)	Length (m)	TOTAL Weight	Segment Weight (Ton)
579						
1	7.3	6.4	2.4	2.5	52.9	68.6
1	7.3	6.4	2.4	2.5	52.9	68.6
1	7.3	4	2.4	2.5	52.5	52.5
2	7.3	4	2.4	2.7	41.1	41.1
1	7.3	4	2.4	2.5	52.5	52.5
2	7.3	4	2.4	2.7	36.7	36.7
2	7.3	4	2.4	2.7	41.1	41.1
2	7.3	4	2.4	2.7	34.6	34.6
2	7.3	4	2.4	2.7	33.6	33.6
2	7.3	4	2.4	2.7	33.5	33.5
1	7.3	6.4	2.4	2.5	52.9	68.6
2	7.3	4	2.4	2.7	33.5	33.5
2	7.3	4	2.4	2.7	36.7	36.7
2	7.3	4	2.4	2.7	36.7	36.7
1	7.3	4	2.4	2.5	52.5	52.5
4	7.3	4	2.4	2.77	42.1	42.1
2	7.3	4	2.4	2.7	34.6	34.6
2	7.3	4	2.4	2.7	33.6	33.6
4	7.3	4	2.4	2.7	33.5	33.5
1	7.3	4	2.4	2.5	52.5	52.5
2	7.3	4	2.4	2.7	36.7	36.7
1	7.3	6.4	2.4	2.5	52.9	68.6
2	7.3	4	2.4	2.77	37.6	37.6
2	7.3	4	2.4	2.77	35.5	35.5
2	7.3	4	2.4	2.77	34.5	34.5
2	7.3	4	2.4	2.77	34.3	34.3
2	7.3	4	2.4	2.77	34.3	34.3
2	7.3	4	2.4	2.77	34.3	34.3
2	7.3	4	2.4	2.77	34.3	34.3
5	7.3	4	2.4	2.77	42.1	42.1
4	7.3	4	2.4	2.77	37.6	37.6
2	7.3	4	2.4	2.77	34.5	34.5
2	7.3	4	2.4	2.77	34.3	34.3
2	7.3	4	2.4	2.77	34.3	34.3
2	7.3	4	2.4	2.77	34.3	34.3
1	7.3	4	2.4	2.77	34.5	34.5
5	7.3	4	2.4	2.77	42.1	42.1
1	7.592	6.4	2.4	2.5	53.5	69.2
1	7.592	4	2.4	2.5	52.9	52.9
2	7.592	4	2.4	2.842	43.7	43.7
2	7.592	4	2.4	2.9	39.8	39.8
2	7.592	4	2.4	2.842	36.9	36.9
2	7.592	4	2.4	2.9	36.5	36.5
2	7.592	4	2.4	2.9	36.3	36.3
1	7.592	4	2.4	2.5	52.9	52.9
2	7.592	4	2.4	2.9	44.6	44.6
2	7.592	4	2.4	2.9	39.8	39.8
2	7.592	4	2.4	2.842	36.9	36.9
2	7.592	4	2.4	2.842	35.8	35.8
2	7.592	4	2.4	2.842	35.8	35.8
1	7.592	4	2.4	2.5	52.9	52.9
2	7.592	4	2.4	2.65	40.8	40.8
2	7.592	4	2.4	2.65	36.5	36.5
2	7.592	4	2.4	2.65	34.5	34.5
2	7.592	4	2.4	2.65	33.5	33.5
2	7.592	4	2.4	2.65	33.5	33.5
1	9.1	4	2.4	2.5	55.1	55.1
2	9.1	4	2.4	2.9	47.1	47.1
4	9.1	4	2.4	2.9	42.3	42.3
2	9.1	4	2.4	2.9	39.0	39.0
2	9.1	4	2.4	2.9	38.9	38.9
2	9.1	4	2.4	2.9	38.9	38.9
2	9.1	4	2.4	2.9	38.9	38.9
2	9.1	4	2.4	2.9	38.9	38.9
1	9.1	4	2.4	2.5	57.1	72.8
4	9.1	4	2.4	2.9	47.1	47.1
1	9.1	4	2.4	2.5	55.1	55.1
4	9.1	4	2.4	2.78	45.2	45.2
2	9.1	4	2.4	2.78	40.6	40.6
2	9.1	4	2.4	2.78	38.5	38.5
2	9.1	4	2.4	2.78	37.5	37.5
2	9.1	4	2.4	2.78	37.5	37.5
1	15.063	5.66	2.4	2.75	61.6	61.6
1	9.1	4	2.4	2.5	55.1	55.1
2	9.1	4	2.4	2.65	43.1	43.1
4	9.1	4	2.4	2.65	38.8	38.8
4	9.1	4	2.4	2.65	35.8	35.8
2	9.1	4	2.4	2.65	35.8	35.8
2	7.3	6.4	2.4	2.5	0.0	61.6
6	7.3	4	2.4	2.769	0.0	38.8
7	7.3	4	2.4	2.769	0.0	38.8
3	9.1	4	2.4	2.75	37.1	37.1
3	9.1	4	2.4	2.75	37.1	37.1
4	9.1	4	2.4	2.75	37.1	37.1
3	9.1	4	2.4	2.75	38.2	38.2
3	9.1	4	2.4	2.75	40.2	40.2
1	9.14	4	2.4	2.5	55.2	55.2
2	9.14	4	2.4	2.77	45.1	45.1
2	9.14	4	2.4	2.77	40.6	40.6
2	9.14	4	2.4	2.77	38.5	38.5
2	11.5	5.66	2.4	2	57.6	57.6
2	11.5	5.66	2.4	2.7	54.9	54.9
2	11.5	5.66	2.4	2	57.6	57.6
2	11.5	5.66	2.4	2.7	54.9	54.9
2	11.5	5.66	2.4	2.7	48.8	48.8
2	11.5	5.66	2.4	2.7	46.8	46.8
2	11.5	5.66	2.4	2.7	45.8	45.8
2	15.063	5.66	2.4	2	61.7	61.7
2	9.14	4	2.4	2.77	37.4	37.4
2	9.14	4	2.4	2.77	37.3	37.3
2	11.5	5.66	2.4	2.7	48.8	48.8
2	11.5	5.66	2.4	2.7	46.8	46.8
2	15.063	5.66	2.4	2.75	61.6	61.6
2	9.14	4	2.4	2.77	37.3	37.3
2	11.5	5.66	2.4	2.7	45.8	45.8
1	15.063	5.66	2.4	2.75	55.4	55.4
2	9.14	4	2.4	2.77	37.3	37.3
2	9.14	4	2.4	2.77	37.3	37.3
1	9.14	6.4	2.4	2.5	57.2	72.9
4	9.14	4	2.4	2.77	45.1	45.1
2	11.5	5.66	2.4	2.7	45.6	45.6
2	11.5	5.66	2.4	2.7	45.6	45.6
2	11.5	5.66	2.4	2.7	45.6	45.6
2	11.5	5.66	2.4	2.7	45.6	45.6
2	15.063	5.66	2.4	2.75	53.4	53.4
4	11.5	5.66	2.4	2.7	45.6	45.6
4	15.063	5.66	2.4	2.75	52.3	52.3
4	15.063	5.66	2.4	2.75	52.3	52.3
4	15.063	5.66	2.4	2.75	52.3	52.3

SUMMARY	Segs
Jun-17	28.0
Jul-17	46.0
Aug-17	29.0
Sep-17	43.0
Oct-17	52.0
Nov-17	44.0
Dec-17	45.0
Jan-18	39.0
Feb-18	53.0
Mar-18	58.0
Apr-18	52.0
May-18	40.0
Jun-18	50.0
	579.0



QTY	Deck Width	Box Soffit	Max Depth	Length	TOTAL	Segment
579	(m)	Width (m)	(m)	(m)	Weight	Weight (Ton)
1	7.3	6.4	2.4	2.5	52.9	68.6
1	7.3	6.4	2.4	2.5	52.9	68.6
1	7.3	4	2.4	2.5	52.5	52.5
2	7.3	4	2.4	2.7	41.1	41.1
1	7.3	4	2.4	2.5	52.5	52.5
2	7.3	4	2.4	2.7	36.7	36.7
2	7.3	4	2.4	2.7	41.1	41.1
2	7.3	4	2.4	2.7	34.6	34.6
2	7.3	4	2.4	2.7	33.6	33.6
2	7.3	4	2.4	2.7	33.5	33.5
1	7.3	6.4	2.4	2.5	52.9	68.6
2	7.3	4	2.4	2.7	33.5	33.5
2	7.3	4	2.4	2.7	36.7	36.7
2	7.3	4	2.4	2.7	36.7	36.7
1	7.3	4	2.4	2.5	52.5	52.5
4	7.3	4	2.4	2.77	42.1	42.1
2	7.3	4	2.4	2.7	34.6	34.6
2	7.3	4	2.4	2.7	33.6	33.6
4	7.3	4	2.4	2.7	33.5	33.5
1	7.3	4	2.4	2.5	52.5	52.5
2	7.3	4	2.4	2.7	36.7	36.7
1	7.3	6.4	2.4	2.5	52.9	68.6
2	7.3	4	2.4	2.77	37.6	37.6
2	7.3	4	2.4	2.77	35.5	35.5
2	7.3	4	2.4	2.77	34.5	34.5
2	7.3	4	2.4	2.77	34.3	34.3
2	7.3	4	2.4	2.77	34.3	34.3
2	7.3	4	2.4	2.77	34.3	34.3
2	7.3	4	2.4	2.77	34.3	34.3
5	7.3	4	2.4	2.77	42.1	42.1
4	7.3	4	2.4	2.77	37.6	37.6
2	7.3	4	2.4	2.77	34.5	34.5
2	7.3	4	2.4	2.77	34.3	34.3
2	7.3	4	2.4	2.77	34.3	34.3
2	7.3	4	2.4	2.77	34.3	34.3
2	7.3	4	2.4	2.77	34.3	34.3
1	7.3	4	2.4	2.77	34.5	34.5
5	7.3	4	2.4	2.77	42.1	42.1
1	7.592	6.4	2.4	2.5	53.5	69.2
1	7.592	4	2.4	2.5	52.9	52.9
2	7.592	4	2.4	2.842	43.7	43.7
2	7.592	4	2.4	2.9	39.8	39.8
2	7.592	4	2.4	2.842	36.9	36.9
2	7.592	4	2.4	2.9	36.5	36.5
2	7.592	4	2.4	2.9	36.3	36.3
1	7.592	4	2.4	2.5	52.9	52.9
2	7.592	4	2.4	2.9	44.6	44.6
2	7.592	4	2.4	2.9	39.8	39.8
2	7.592	4	2.4	2.842	36.9	36.9
2	7.592	4	2.4	2.842	35.8	35.8
2	7.592	4	2.4	2.842	35.8	35.8
1	7.592	4	2.4	2.5	52.9	52.9
2	7.592	4	2.4	2.65	40.8	40.8
2	7.592	4	2.4	2.65	36.5	36.5
2	7.592	4	2.4	2.65	34.5	34.5
2	7.592	4	2.4	2.65	33.5	33.5
2	7.592	4	2.4	2.65	33.5	33.5
1	9.1	4	2.4	2.5	55.1	55.1
2	9.1	4	2.4	2.9	47.1	47.1
4	9.1	4	2.4	2.9	42.3	42.3
2	9.1	4	2.4	2.9	39.0	39.0
2	9.1	4	2.4	2.9	38.9	38.9
2	9.1	4	2.4	2.9	38.9	38.9
2	9.1	4	2.4	2.9	38.9	38.9
2	9.1	4	2.4	2.9	38.9	38.9
1	9.1	4	2.4	2.5	57.1	72.8
4	9.1	4	2.4	2.9	47.1	47.1
1	9.1	4	2.4	2.5	55.1	55.1
4	9.1	4	2.4	2.78	45.2	45.2
2	9.1	4	2.4	2.78	40.6	40.6
2	9.1	4	2.4	2.78	38.5	38.5
2	9.1	4	2.4	2.78	37.5	37.5
4	9.1	4	2.4	2.78	37.5	37.5
1	15.063	5.66	2.4	2.75	61.6	61.6
1	9.1	4	2.4	2.5	55.1	55.1
2	9.1	4	2.4	2.65	43.1	43.1
4	9.1	4	2.4	2.65	38.8	38.8
4	9.1	4	2.4	2.65	35.8	35.8
2	9.1	4	2.4	2.65	35.8	35.8
2	7.3	6.4	2.4	2.5	0.0	61.6
6	7.3	4	2.4	2.769	0.0	38.8
7	7.3	4	2.4	2.769	0.0	38.8
3	9.1	4	2.4	2.75	37.1	37.1
3	9.1	4	2.4	2.75	37.1	37.1
4	9.1	4	2.4	2.75	37.1	37.1
3	9.1	4	2.4	2.75	38.2	38.2
3	9.1	4	2.4	2.75	40.2	40.2
1	9.14	4	2.4	2.5	55.2	55.2
2	9.14	4	2.4	2.77	45.1	45.1
2	9.14	4	2.4	2.77	40.6	40.6
2	9.14	4	2.4	2.77	38.5	38.5
2	11.5	5.66	2.4	2	57.6	57.6
2	11.5	5.66	2.4	2.7	54.9	54.9
2	11.5	5.66	2.4	2	57.6	57.6
2	11.5	5.66	2.4	2.7	54.9	54.9
2	11.5	5.66	2.4	2.7	48.8	48.8
2	11.5	5.66	2.4	2.7	46.8	46.8
2	11.5	5.66	2.4	2.7	45.8	45.8
2	15.063	5.66	2.4	2	61.7	61.7
2	9.14	4	2.4	2.77	37.4	37.4
2	9.14	4	2.4	2.77	37.3	37.3
2	11.5	5.66	2.4	2.7	48.8	48.8
2	11.5	5.66	2.4	2.7	46.8	46.8
2	15.063	5.66	2.4	2.75	61.6	61.6
2	9.14	4	2.4	2.77	37.3	37.3
2	11.5	5.66	2.4	2.7	45.8	45.8
1	15.063	5.66	2.4	2.75	55.4	55.4
2	9.14	4	2.4	2.77	37.3	37.3
2	9.14	4	2.4	2.77	37.3	37.3
1	9.14	6.4	2.4	2.5	57.2	72.9
4	9.14	4	2.4	2.77	45.1	45.1
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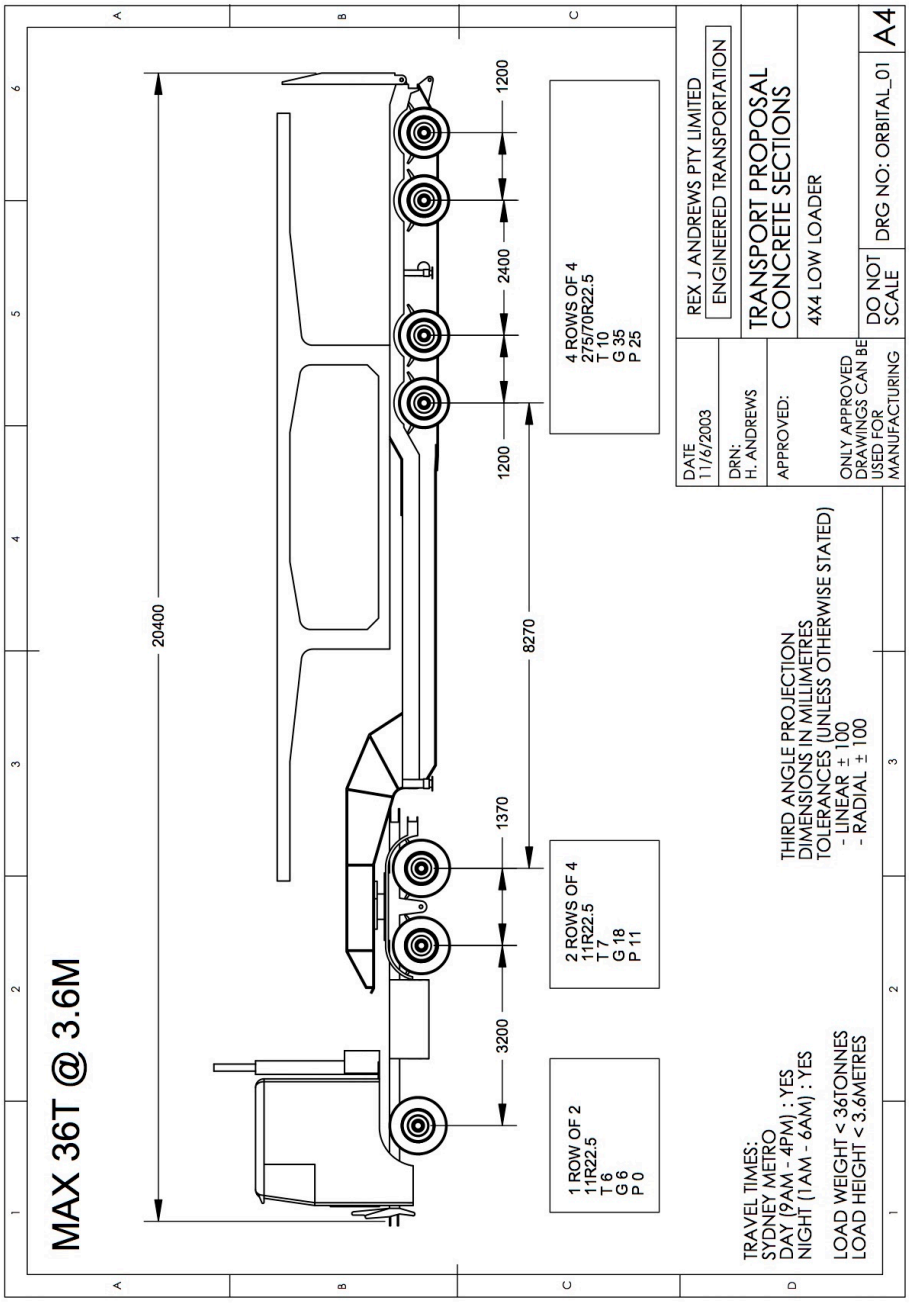
2	11.5	5.66	2.4	2.7	45.6	45.6
2	11.5	5.66	2.4	2.7	45.6	45.6
2	11.5	5.66	2.4	2.7	45.6	45.6
2	15.063	5.66	2.4	2.75	53.4	53.4
4	11.5	5.66	2.4	2.7	45.6	45.6
4	15.063	5.66	2.4	2.75	52.3	52.3
4	15.063	5.66	2.4	2.75	52.3	52.3
4	15.063	5.66	2.4	2.75	52.3	52.3

SUMMARY	Segs
Jun-17	28.0
Jul-17	46.0
Aug-17	29.0
Sep-17	43.0
Oct-17	52.0
Nov-17	44.0
Dec-17	45.0
Jan-18	39.0
Feb-18	53.0
Mar-18	58.0
Apr-18	52.0
May-18	40.0
Jun-18	50.0
	579.0

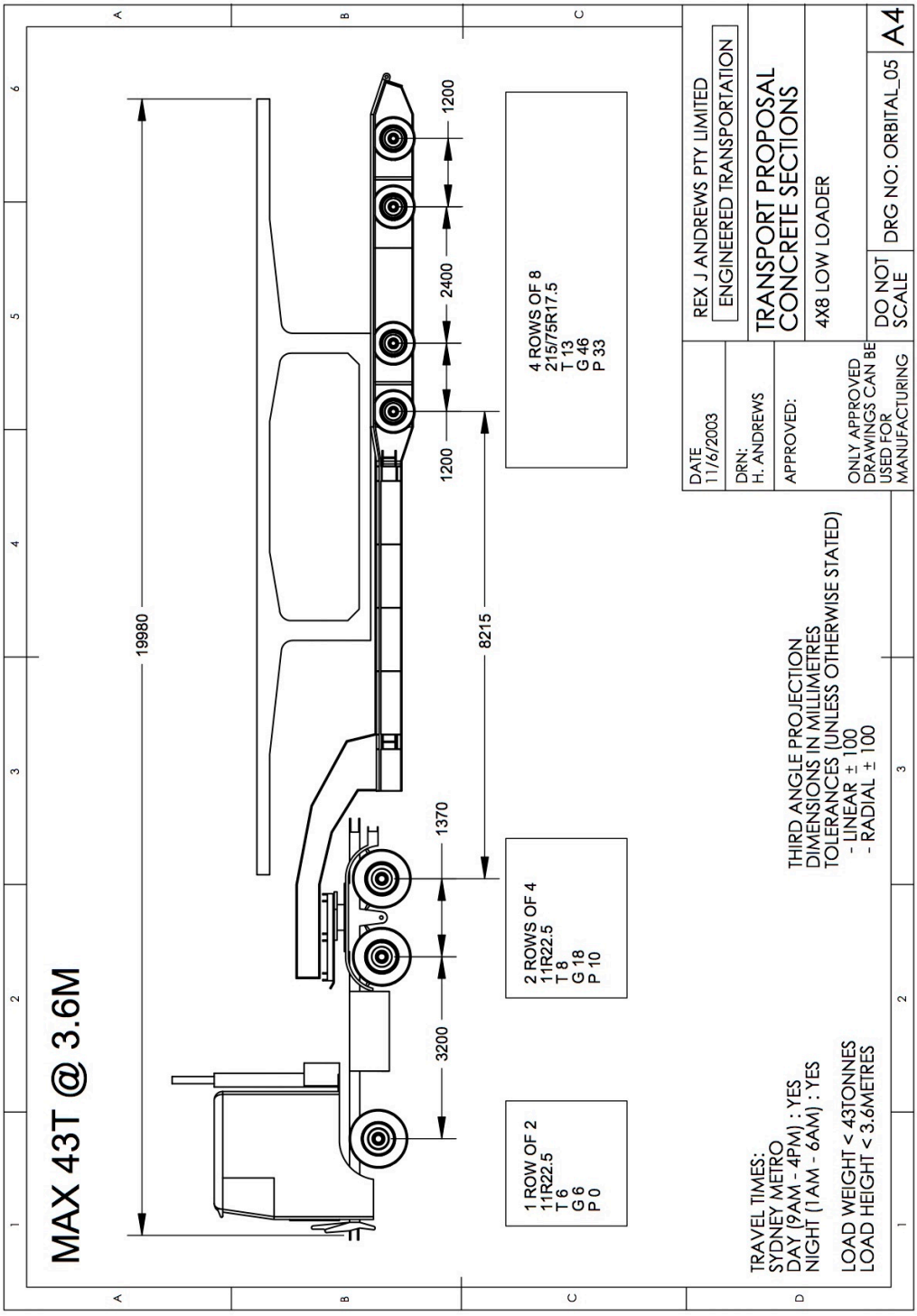
5.0 Typical transporters.

Transport Combinations:

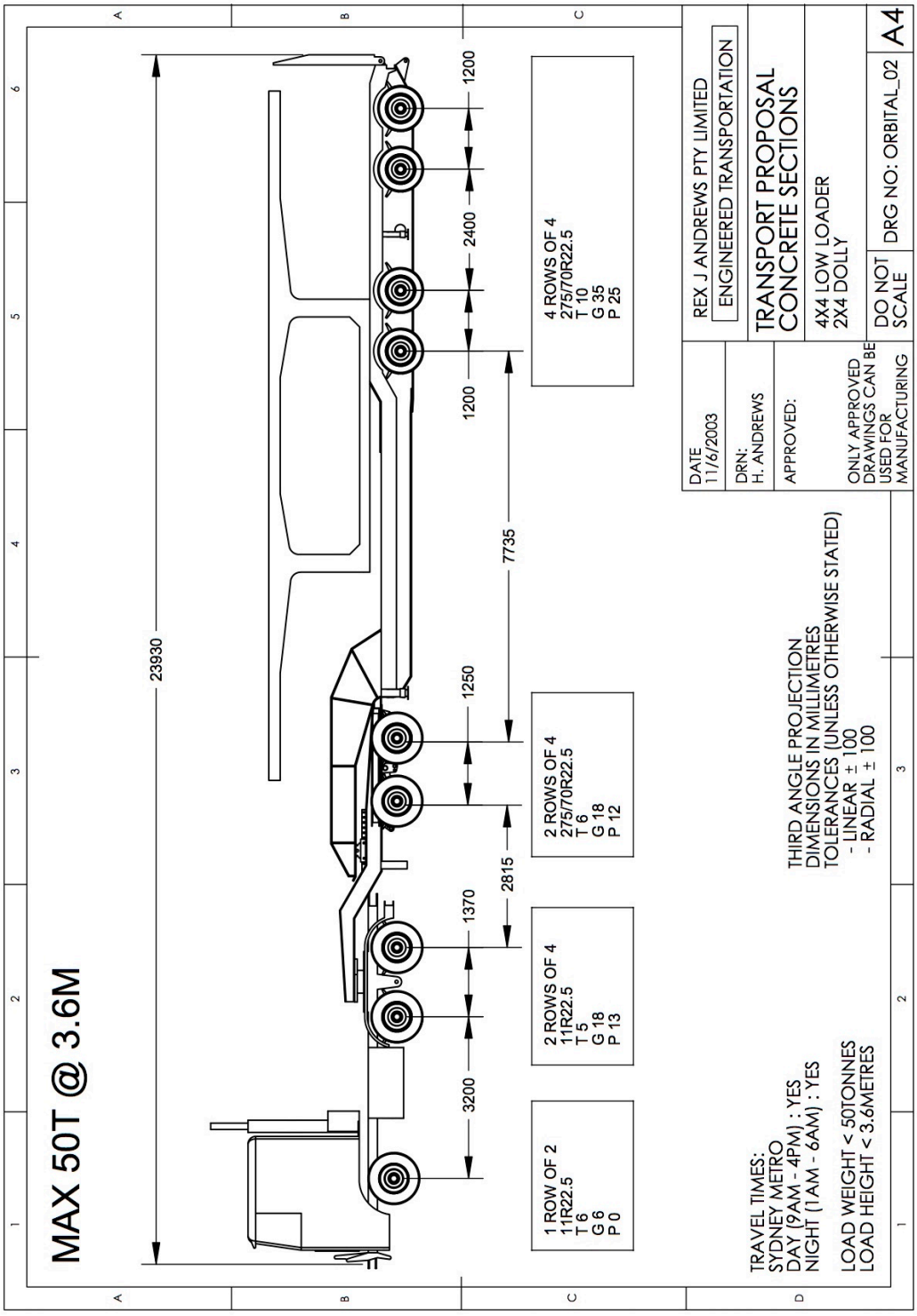
a) Configuration. Prime mover with 4 x 4 low-loader
Overall length: 20.4 long x 3.6 wide x 4.6 high – Max load 36.0T
2 x Company pilots



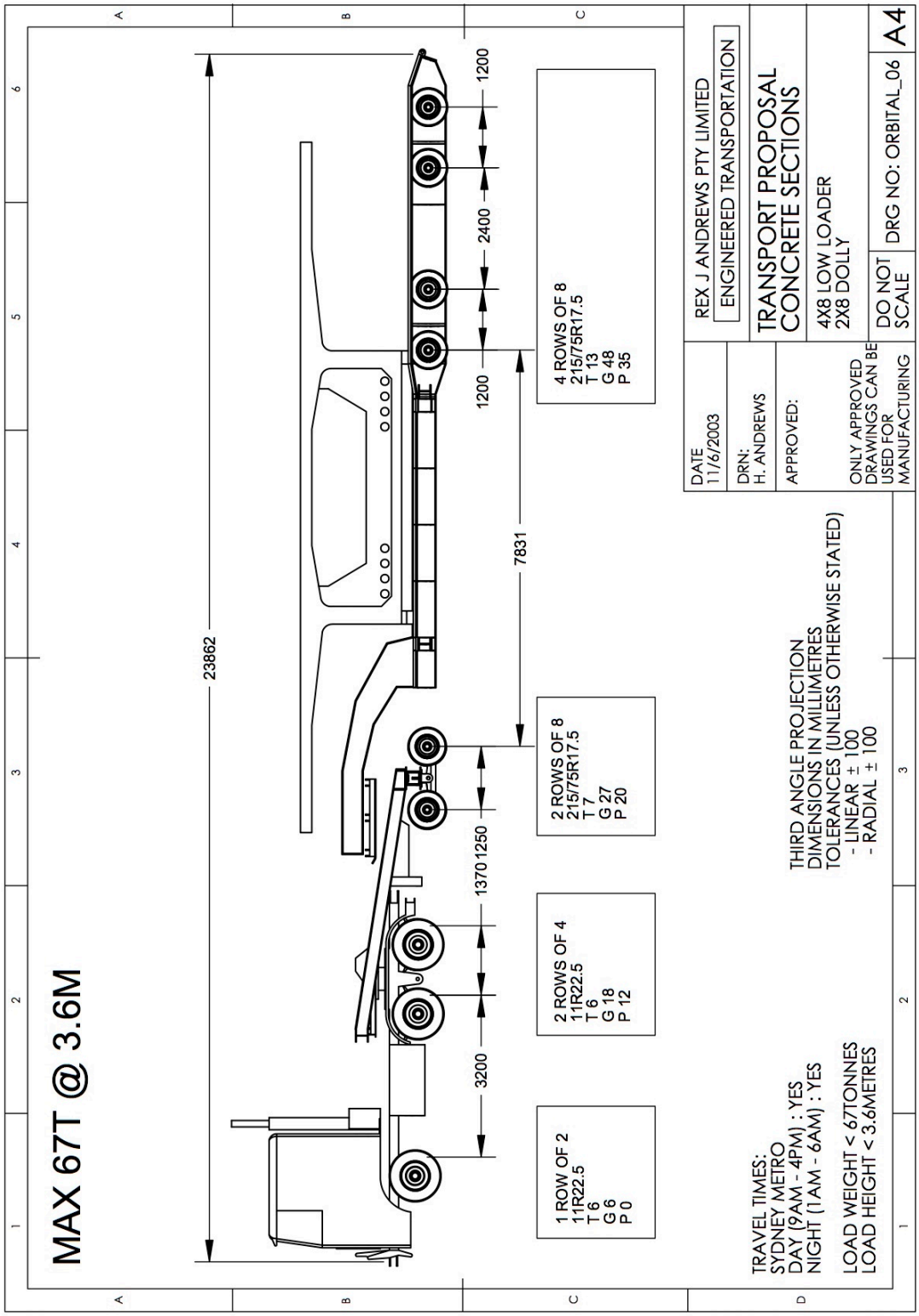
b) Configuration. Prime mover with 4 x 8 Low-loader
Overall length: 21.0 long x 3.6 wide x 4.6 high – Max load 43.0T
2 x Company pilots

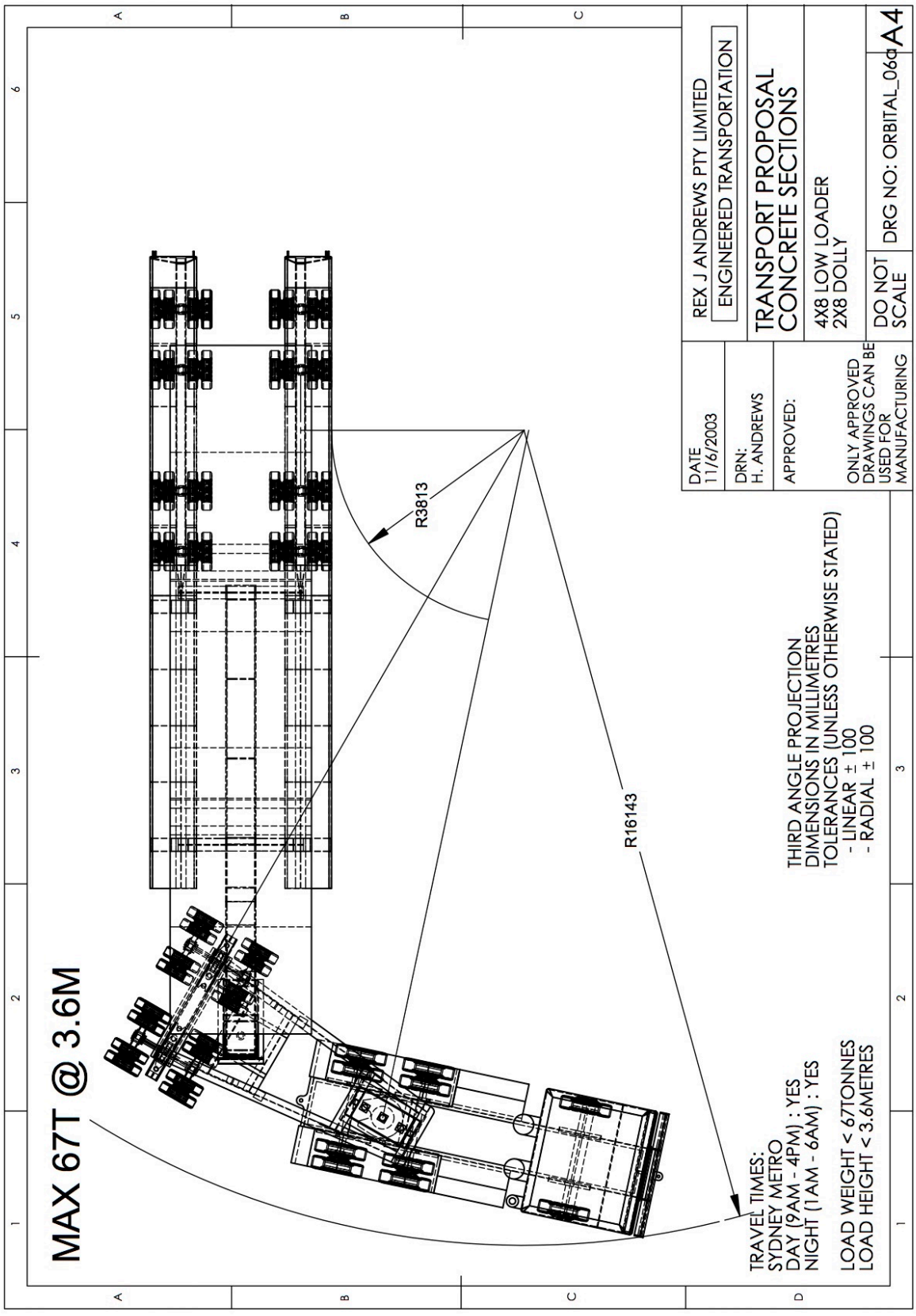


c) Configuration. Prime mover with 2 x 4 dolly and 4 x 4 low-loader
Overall length: 24.0 long x 3.6 wide x 4.6 high – Max load 50.0T
2 x Company pilots

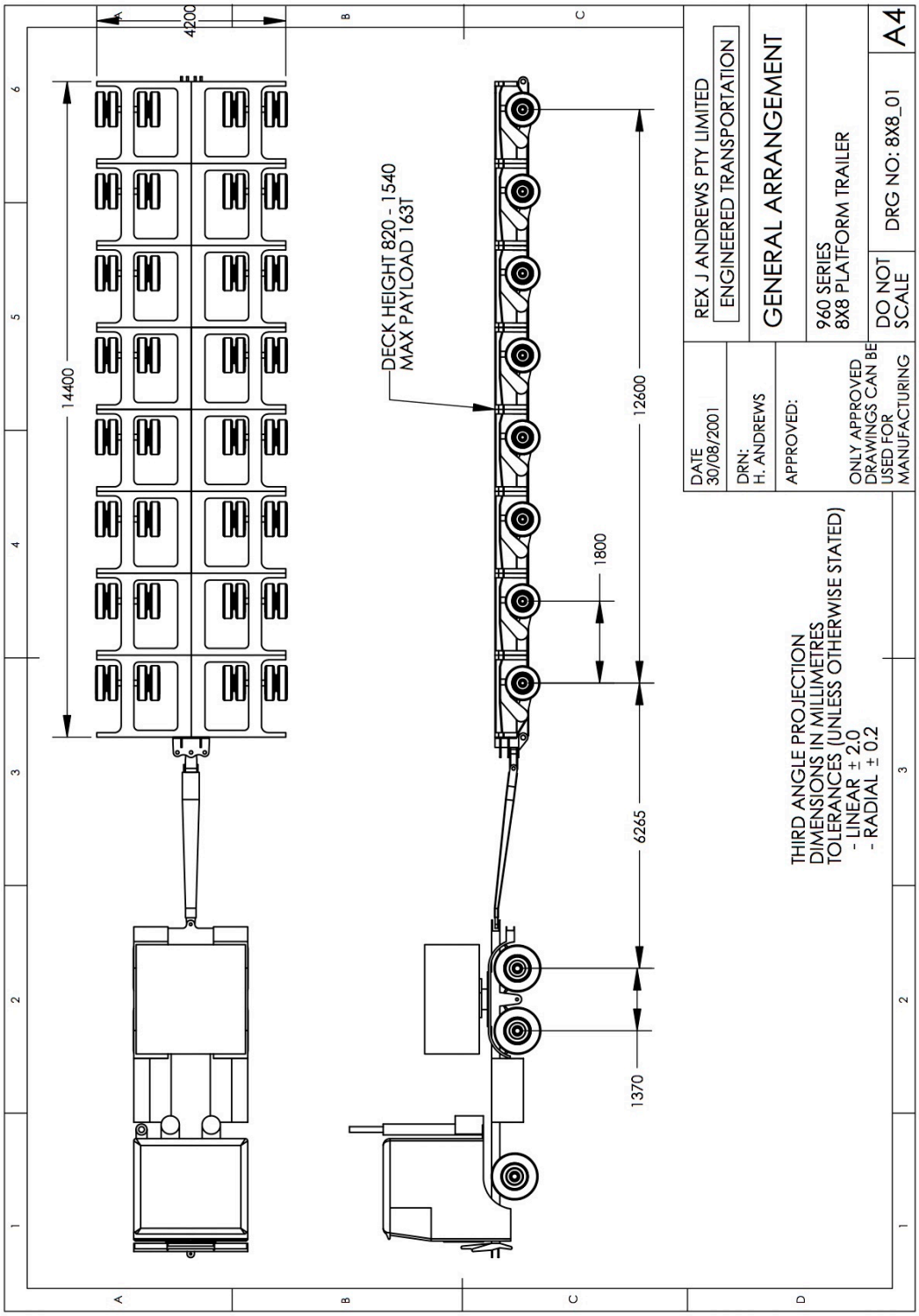


d) Configuration. Prime mover with 2 x 8 dolly and 4 x 8 low-loader
Overall length: 24.0 long x 4.2 wide x 4.6 high – Max load 67.0T
2 x Company pilots




MAX 67T @ 3.6M
R3813
R16143
REX J ANDREWS PTY LIMITED
ENGINEERED TRANSPORTATION
TRANSPORT PROPOSAL
CONCRETE SECTIONS
4X8 LOW LOADER
2X8 DOLLY
DO NOT SCALE
DRG NO: ORBITAL_06
A4
DATE 11/6/2003
DRN: H. ANDREWS
APPROVED:
ONLY APPROVED DRAWINGS CAN BE USED FOR MANUFACTURING
THIRD ANGLE PROJECTION
DIMENSIONS IN MILLIMETRES
TOLERANCES (UNLESS OTHERWISE STATED)
- LINEAR ± 100
- RADIAL ± 100
TRAVEL TIMES:
SYDNEY METRO
DAY (9AM - 4PM) : YES
NIGHT (1AM - 6AM) : YES
LOAD WEIGHT < 67TONNES
LOAD HEIGHT < 3.6METRES

e) Configuration. Prime mover with 8 x 8 Platform
Overall length: 28.0 long x 4.2 wide x 4.6 high – Max load 95.0T
2 x Company pilots



6.0 Conditions & Pinch Points.

The following are the conditions for this route:

- If for any reason communications fail between any of the pilot, escort of load vehicle occurs, the load is to cease until such time as it can be re-established.
- Roadwork's to be checked with RMS 5 days prior to leaving, and relayed to client with any potential problems. TMC and local RMS regions to also have pre notification of movements.
- Oversize Loads are to travel on route between 12.00am and 5.00am daily.
- The concert segments require 2 Company pilots per load.
- Client to give adequate access for load at the Buchanan facility. As well as supplying unrestricted access at site.
- The vehicles travel only along the centerline of the carriageway of all the bridges (Unless stated otherwise) on the route at a speed **not exceeding 10 km/h** with no sudden braking or acceleration. No other vehicles are permitted on the bridge while the Permit vehicle is on the bridge.
- Approvals to be sought from Local councils and Private Motorway authorities, where required.

The following are the pinch points for this route:

We believe that the are no pinch points along the chosen route.

7.0 Transport approvals required for this move.

Approvals will need to be sought from the following departments.

- RMS (Roads and Maritime service)
- NSW Police service
- Local Councils
- Motorways

8.0 Emergency Contact Numbers & Plan.

- Main Emergency number (000)
- TMC Operations room (1800 679782)
- RMS Heavy Vehicle (1300364847)
- NSW Police (Traffic OSOM 0288821219)
- Rex J Andrews Movement Supervisor (Carl Andrews 0419293423)
- Rex J Andrews operations 24 hrs (02 47217633)
- RMS Hunter region (Bruce Kimber 0411406845 or 0249240614)
- M7 Operations (02 98349261)
- M2 Operations (02 92545279)
- M5 Operations (0298200050)
- 24 Hour heavy towing (GRS) 1300550600

- In the event of an emergency situation, such as breakdown, the load will be moved to the left hand lane/shoulder to ensure minimal traffic impacts; police and pilots (Under the direction of the police) will manage traffic flow. In such instances the TMC should be promptly advised so that all necessary warnings can be made.
- Where a tow is required, the trailer will be unhooked from the prime mover and a standby truck be called. In such instances the TMC should be promptly advised so that all necessary warnings can be made.
- If police decide that the movement should be suspended as a result of time or potential traffic impacts the trailer with the load will be moved to a safe parking location and the TMC will be notified.
- In the event of bad weather, the driver is to notify the first point of contact before departing.
- If the highway is blocked between the pickup location and drop off location, than the load is not to depart.
- Roadwork's to be checked for a second time with RMS 2 days prior to leaving, and relayed to client with any potential problems.

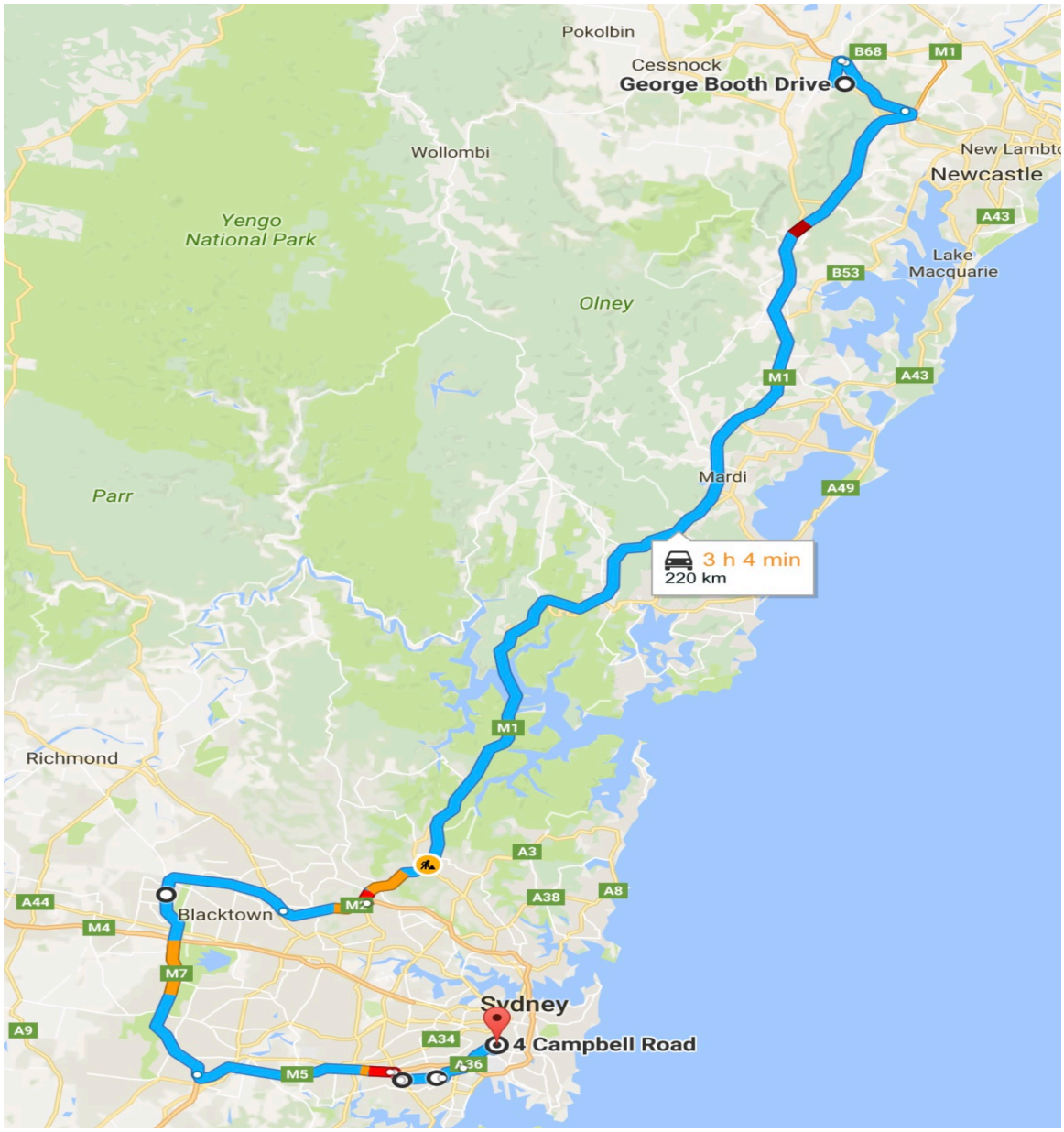
9.0 Transport Summary.

We based our study on the items been transported over the following route.

Route to site (220.0 kilometres):

From this point we looked at the most obvious option, which is as follows.

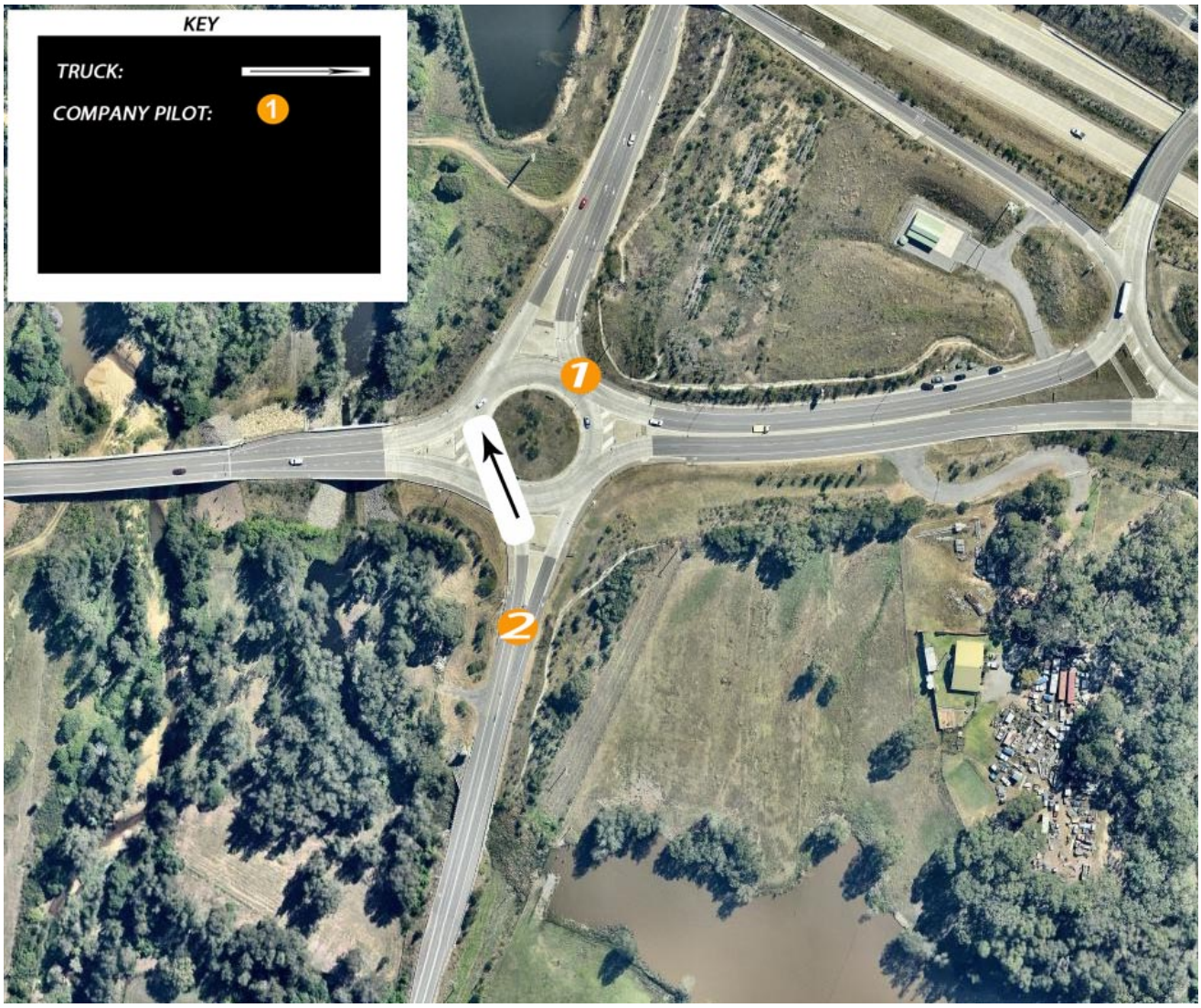
This route took us via George Booth Dr, John Renshaw Dr, Hunter Expy, Pacific Mwy, M1, Pennant Hills Road, M2, M7, M5, King Georges Road, Stoney Creek Road, Forest Road, Princes Highway, Canal Road, Burrows Rd, Campbell Rd.



0.0 Km's: Cast Yard onto George Booth Dr.

PILOT # 1: Warn all eastbound traffic on George Booth Dr.
PILOT # 2: Warn all westbound traffic on George Booth Dr.
PROCEDURE: Load to turn right onto George Booth Dr.

3.8 Km's: George Booth Dr onto John Renshaw Dr.



PILOT # 1: Stay 100 metres in front of the load and warn all oncoming traffic.

PILOT # 2: Stay 50 metres behind the load and warn all traffic.

PROCEDURE: Load to turn right from correct side to the correct side of the roundabout.

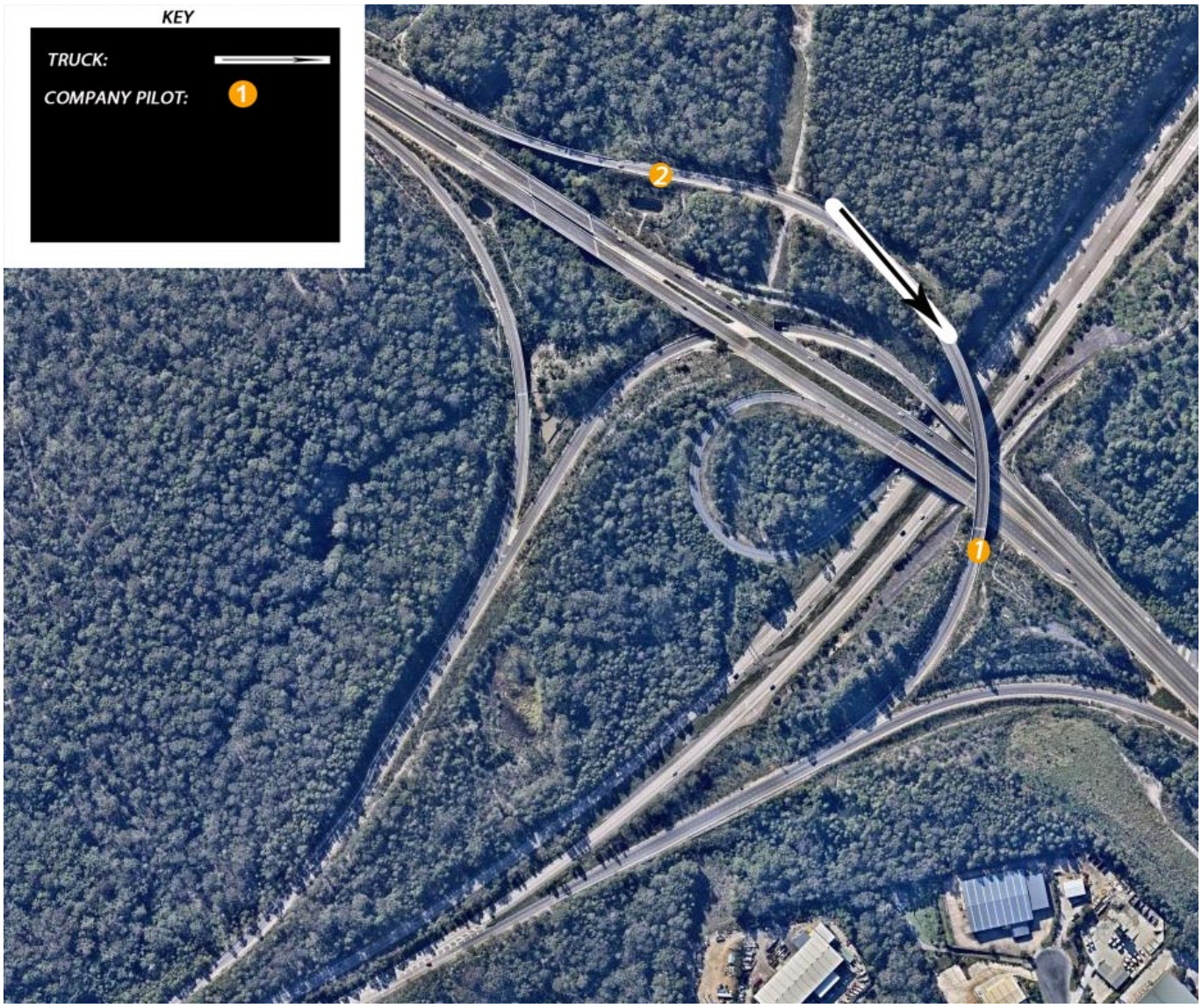
4.1 Km's: John Renshaw onto the Hunter Expressway.

PILOT # 1: Stay 100 metres in front of the load and warn all oncoming traffic.

PILOT # 2: Stay 50 metres behind the load and warn all oncoming traffic.

PROCEDURE: Load to turn right from the correct side to the correct side of the roundabout. Taking the third exit of the roundabout.

13.8 Km's: Hunter Express onto Pacific Mwy (M1)



PILOT # 1: Stay 100 metres in front of the load and warn all oncoming traffic.
PILOT # 2: Stay 50 metres behind the load and warn all oncoming traffic.
PROCEDURE: Truck to use the off-ramp to enter onto the M1 heading southbound.

132.0 Km's: M1 onto Pennant Hills Rd

PILOT # 1: Stay 100 metres in front of the load and warn all oncoming traffic.
PILOT # 2: Stay 50 metres behind the load and warn all oncoming traffic.
PROCEDURE: Load to turn left from correct side to the correct side of the corner.

140.0 Km's: Pennant Hills Road onto the M2 Motorway

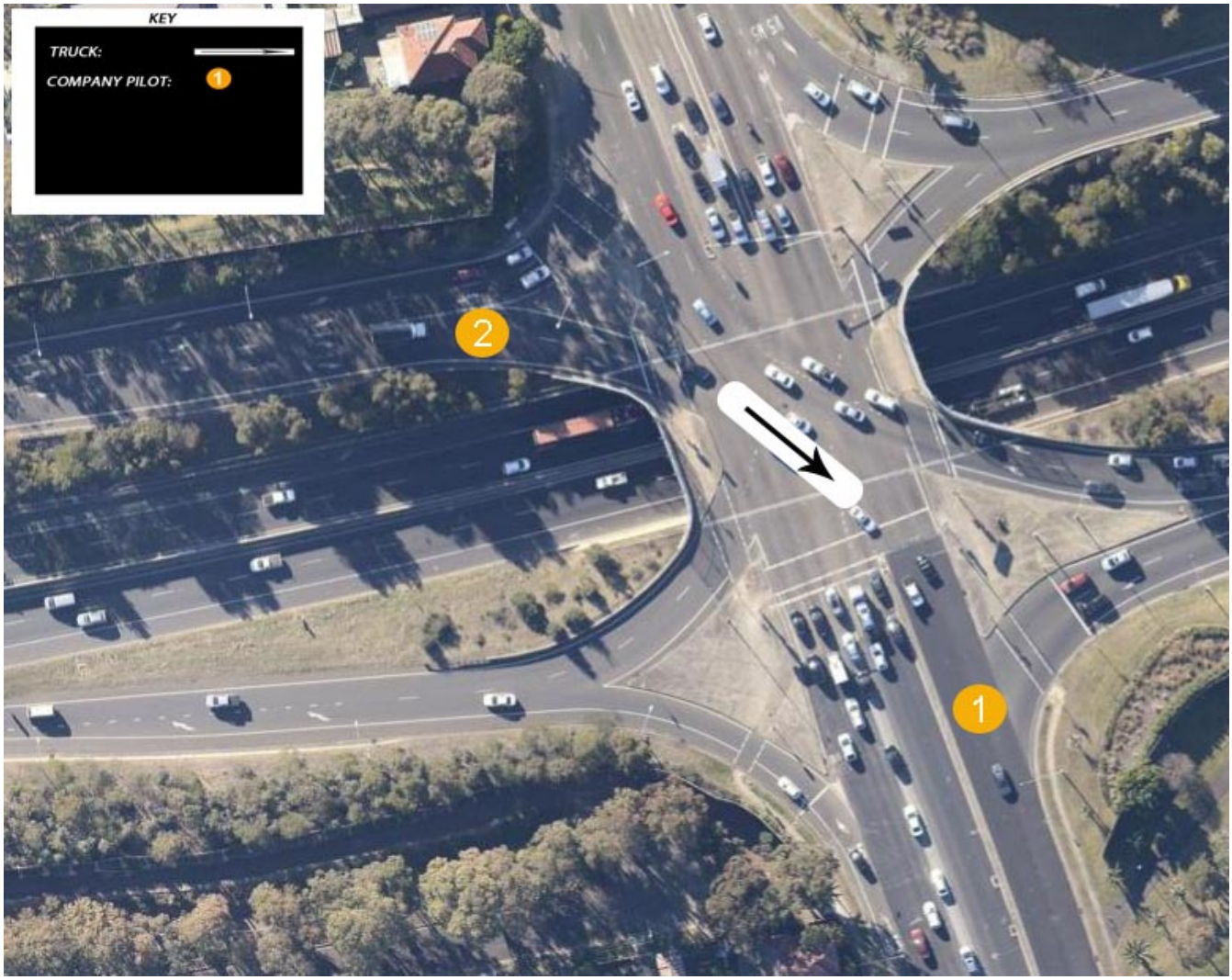
.

PILOT # 1: Stay 100 metres in front of the load and warn all oncoming traffic.

PILOT # 2: Stay 50 metres behind the load and warn all oncoming traffic.

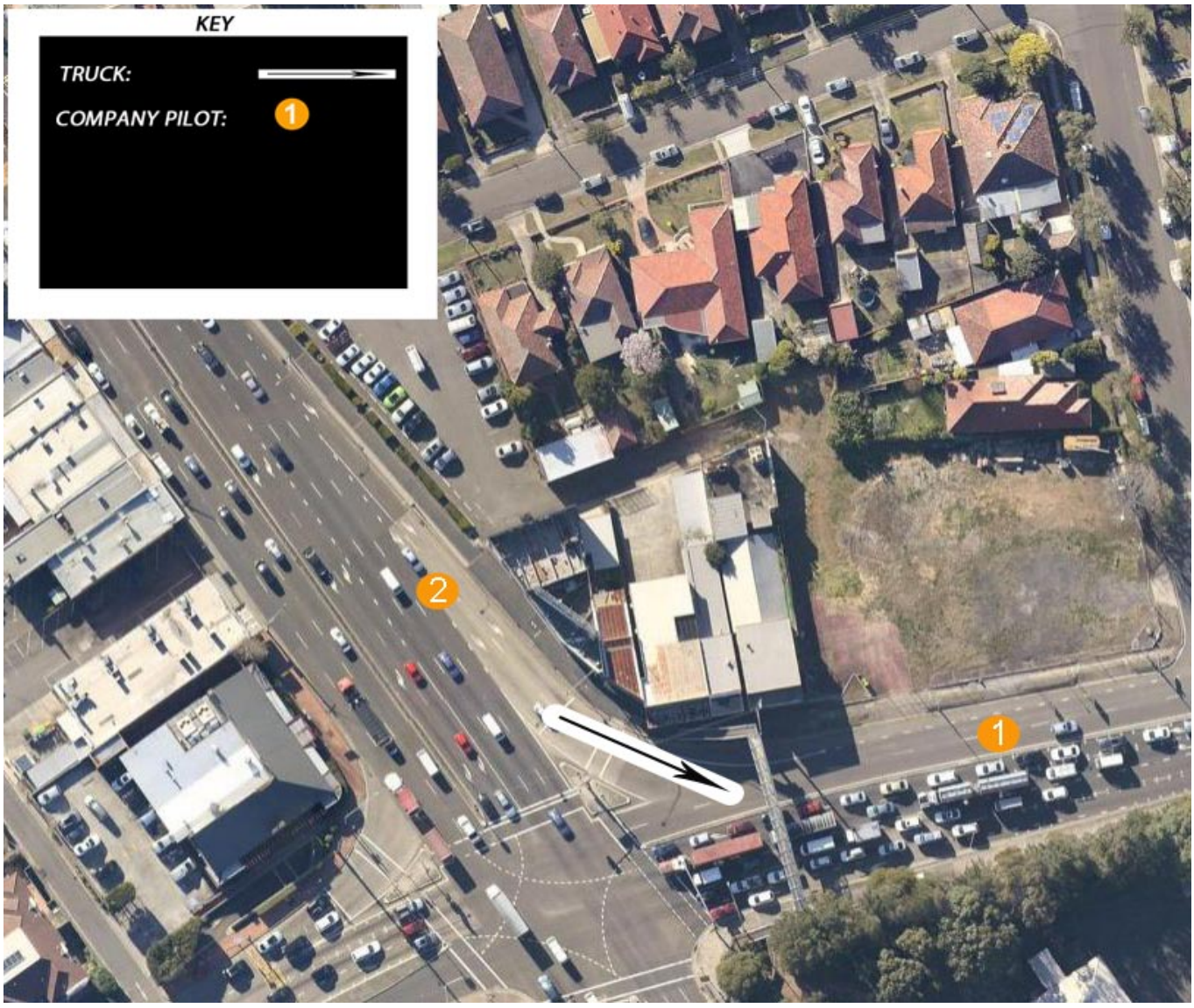
PROCEDURE: Load to turn right onto the M2. (Once onto the M2, built up traffic from behind the load will be directed around right hand side of the load, when safe to do so. Once traffic is clear, utilise standard 2-lane traffic motorway procedures, until King Georges Road).

207.0 Km's: The M5 motorway onto King Georges Road at Beverly Hills.



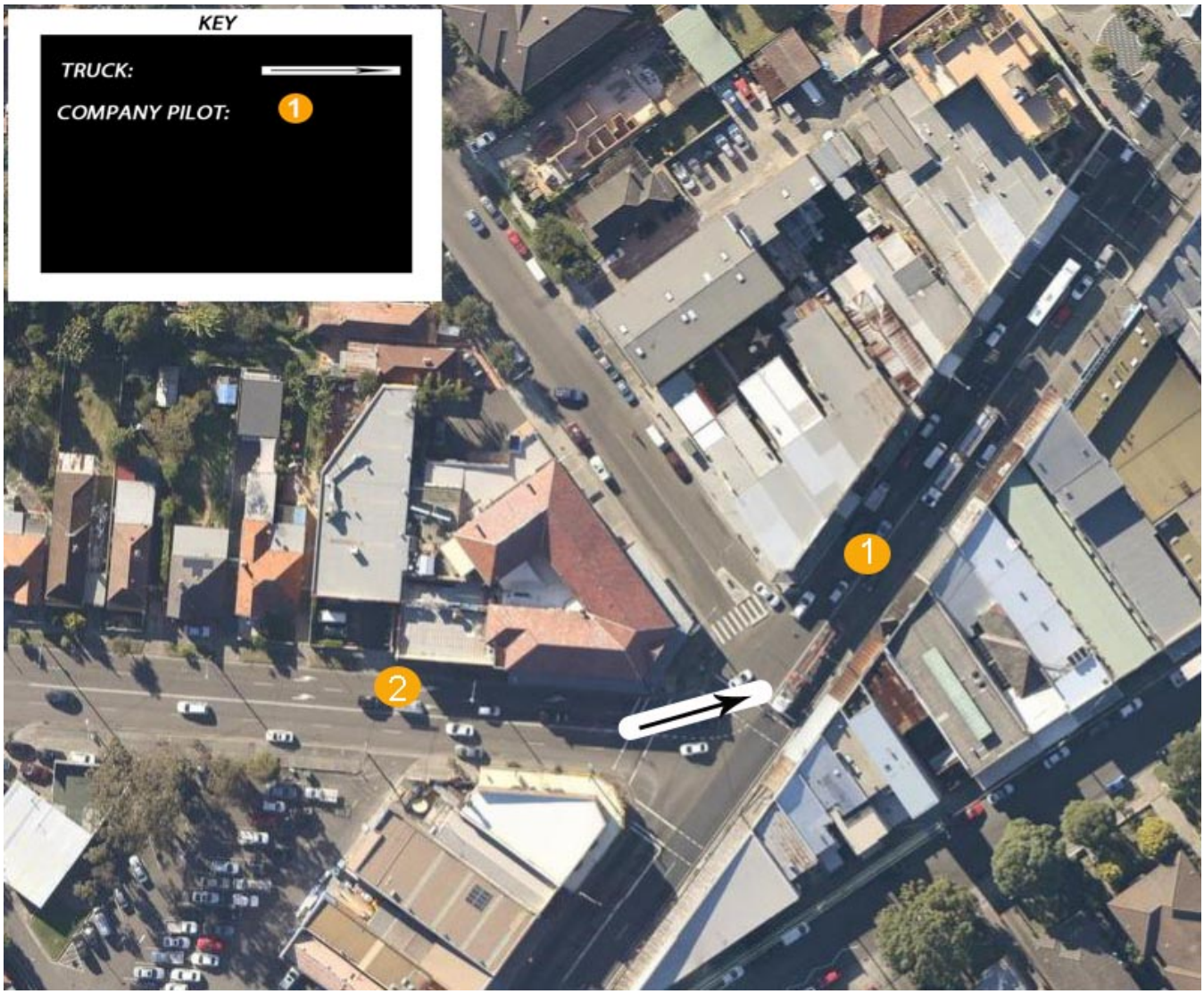
PILOT # 1: Stay 100 metres in front of the load and warn all oncoming traffic.
PILOT # 2: Stay 50 metres behind the load and warn all oncoming traffic.
PROCEDURE: Turn right from correct side to correct side.

208.0 Km's: King Georges Road onto Stony Creek Road at Beverly Hills



PILOT # 1: Stay 100 metres in front of the load and warn all oncoming traffic.
PILOT # 2: Stay 50 metres behind the load and warn all oncoming traffic.
PROCEDURE: Turn left from correct side to correct side.

212.0 Km's: Stony Creek Road onto Forest Road at Rockdale.

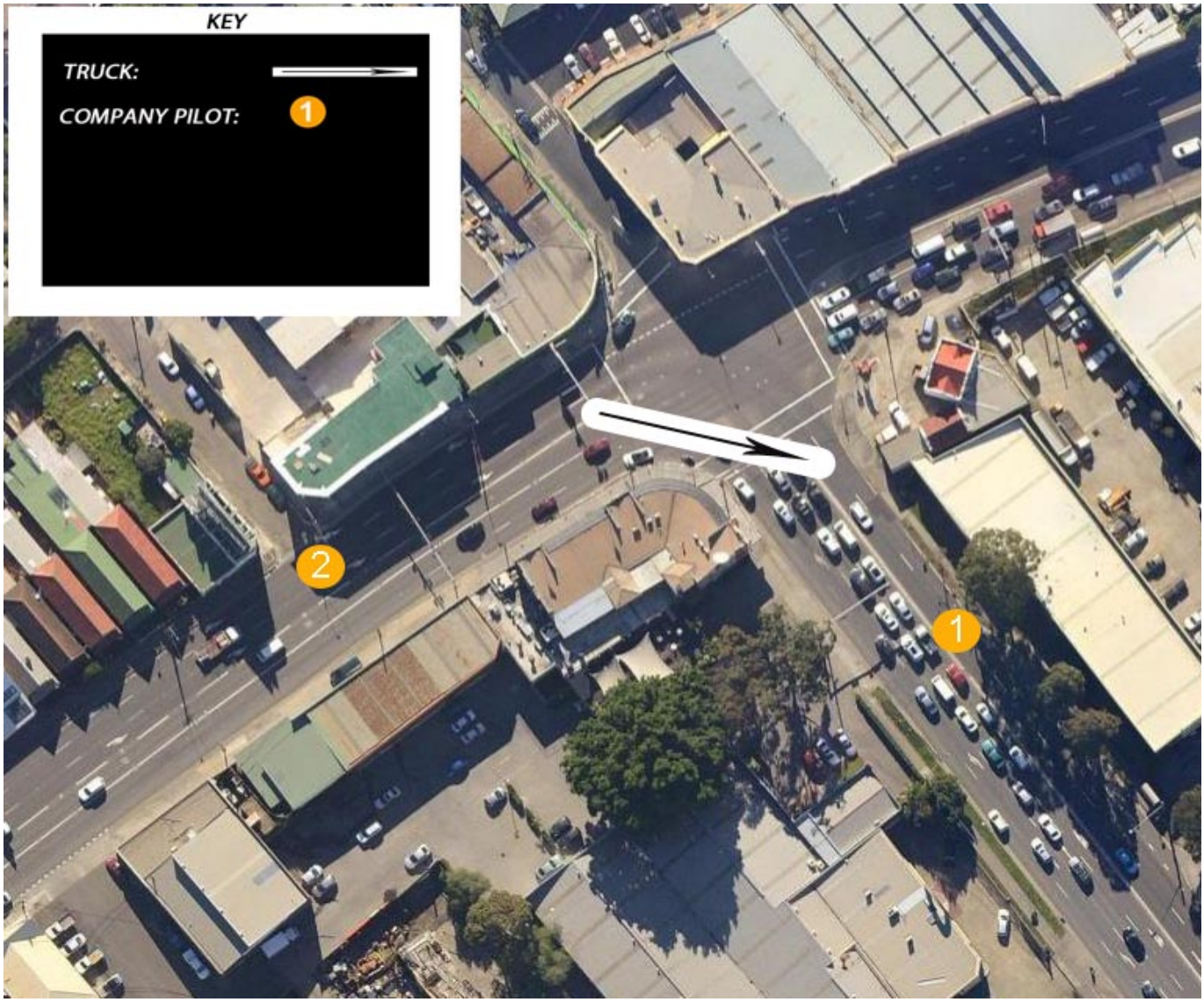


PILOT # 1: Stay 100 metres in front of the load and warn all oncoming traffic.
PILOT # 2: Stay 50 metres behind the load and warn all oncoming traffic.
PROCEDURE: Turn left from correct side to correct side.

215.0 Km's: Forest Road onto the Princes Highway at Arncliffe.

PILOT # 1: Stay 100 metres in front of the load and warn all oncoming traffic.
PILOT # 2: Stay 50 metres behind the load and warn all oncoming traffic.
PROCEDURE: Turn left from correct side to correct side.

218.0 Km's: The Princes Highway onto Canal Road at St Peters.

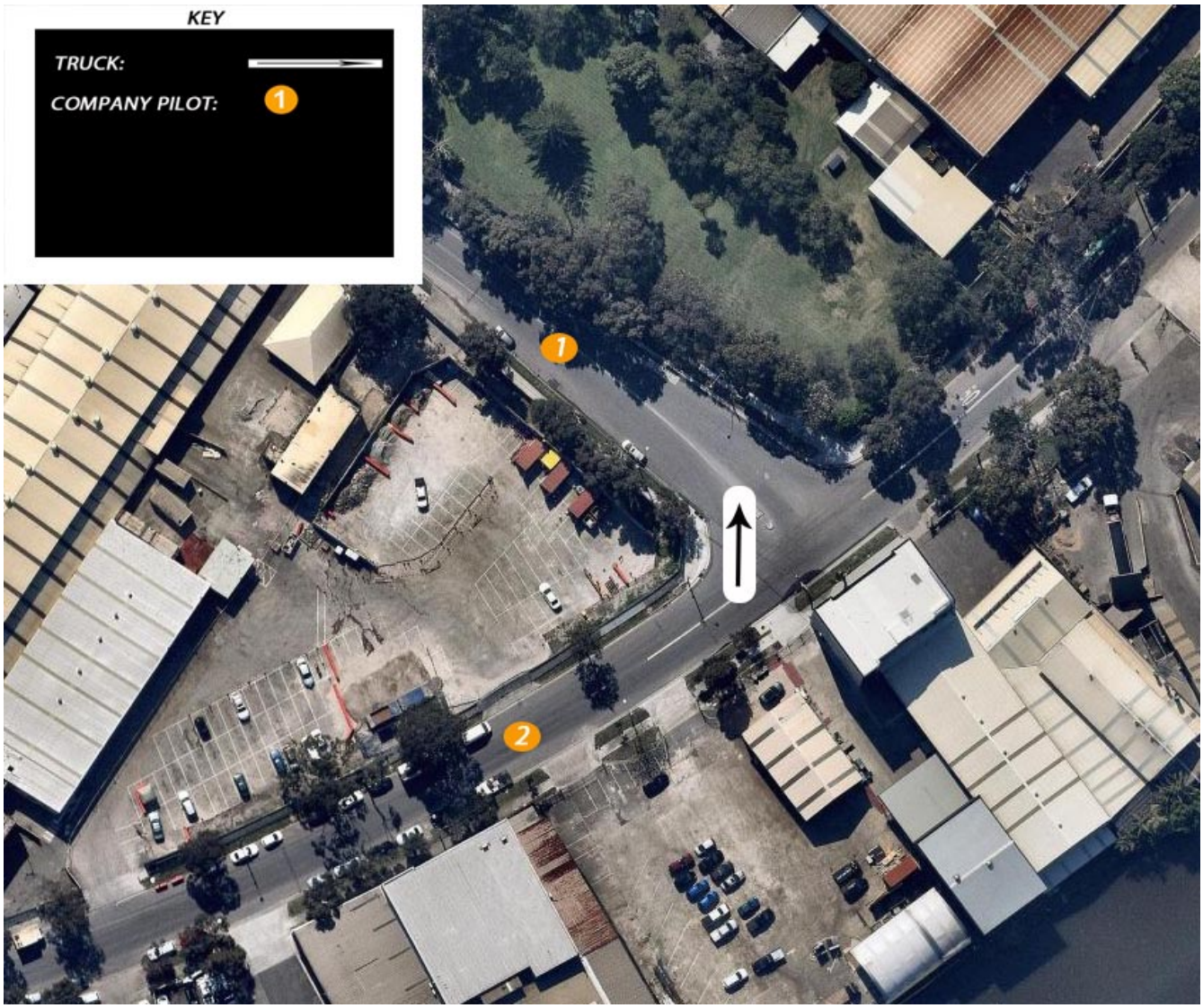


PILOT # 1: Stay 100 metres in front of the load and warn all oncoming traffic.
PILOT # 2: Stay 50 metres behind the load and warn all oncoming traffic.
PROCEDURE: Turn right from correct side to correct side.

219.0 Km's: Canal Road onto Burrows Rd

PILOT # 1: Stay 100 metres in front of the load and warn all oncoming traffic.
PILOT # 2: Stay 50 metres behind the load and warn all oncoming traffic.
PROCEDURE: Load to turn left from correct side to correct side.

220.0 Km's: Burrows Rd onto Campbell Rd.



PILOT # 1: Stay 100 metres in front of the load and warn all oncoming traffic.
PILOT # 2: Stay 50 metres behind the load and warn all oncoming traffic.
PROCEDURE: Turn left from correct side to correct side.

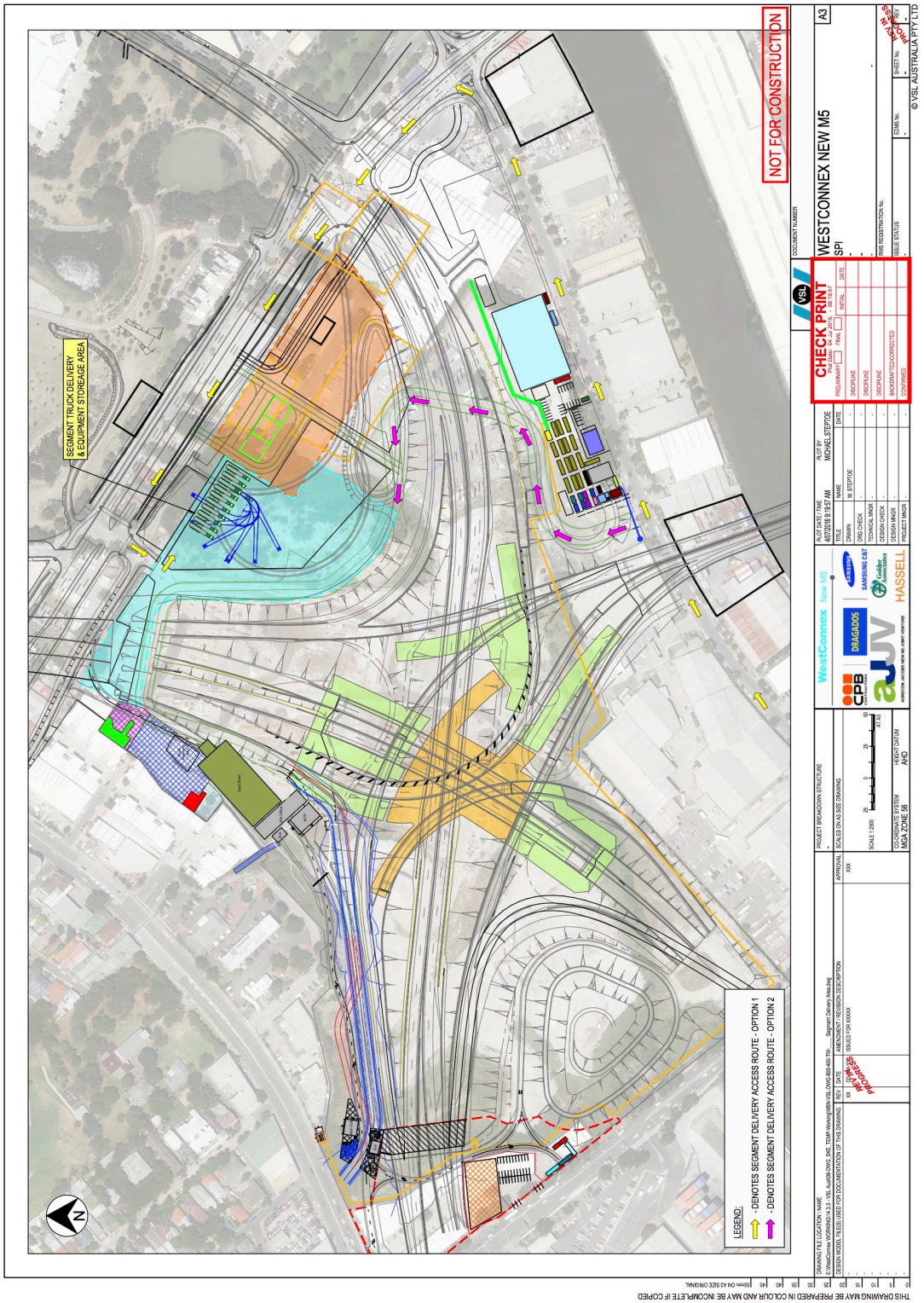
220.5 Km's: Campbell Rd into Site at St Peters.

PILOT # 1: Stay 100 metres in front of the load and hold all oncoming traffic on Albert St.

PILOT # 2: Stay 50 metres behind the load and warn all oncoming traffic.

PROCEDURE: Load is to drive directly into site. Once trailer is unloaded we will than park up for the day until leaving site at 12:00am the following morning.

220.5 Km's: Westconnex Site.



10.0 References:

RMS 2008 Version 2:Operating Conditions: Specific permits for oversize and overmass vehicles and loads

Rex J Andrews P/L Drawings

Rex J Andrews route survey LL170 REV00

Google Earth/Maps

Nearmaps

NHVAS Maintenance Management (NHVAS21193)

NHVAS Basic Fatigue Management (NHVAS21193)

Appendix D

Noise Assessment

RENZO TONIN & ASSOCIATES
inspired to achieve

Acoustics
Vibration
Structural Dynamics

WESTCONNEX NEW M5

Noise Impact Statement: Hunter Valley Precast Facility

29 November 2016

CPB Dragados Samsung Joint Venture

TH014-09 01F01 WXC_NM5 CNVIS Hunter Precast Facility (r4)

30 1982 2012 ACOUSTIC EXCELLENCE
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Renzo Tonin & Associates (NSW) Pty Ltd ABN 29 117 462 861
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Document details

Detail	Reference
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Prepared for:	CPB Dragados Samsung Joint Venture
Address:	Level 6, Building B 201 Coward Street, Mascot, NSW
Attention:	Howard Chemney

Document control

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27.10.2016	Draft report	0	1	JB	TG	TG
07.11.2016	Revision	-	2	JB	TG	TG
08.11.2016	Revision 2	-	3	JB	TG	TG
29.11.2016	Revision 3	-	4	JB	TG	TG

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1 Introduction

This Noise Impact Statement (NIS) has been prepared on behalf of CPB Contractors Dragados Samsung Joint Venture (CDS JV) to support the Review of Environmental Factors for the use of the Hunter Valley Precast Facility for the construction of the precast elements for the WestConnex New M5 Project (New M5 or Project).

This NIS applies to operation of the Hunter Valley Precast Facility during the daytime assessment period, as defined by the NSW Industrial Noise Policy (INP, Environment Protection Authority 2000) [1].

This NIS will be submitted to Roads and Maritime Services (RMS) forming part of the REF for the Project.

1.1 Structure of this NIS

This NIS is structured as follows:

- **Section 2** - Description of proposed works and operating hours
- **Section 3** - Existing acoustic environment
- **Section 4** - Nearest sensitive receivers
- **Section 5** - Noise objectives
- **Section 6** - Operational noise assessment
- **Section 7** - Traffic noise assessment

1.2 Quality assurance

The work documented in this report was carried out in accordance with the Renzo Tonin & Associates Quality Assurance System, which is based on Australian Standard / NZS ISO 9001. Appendix A contains a glossary of acoustic terms used in this report.

2 Description of proposed works and operating hours

2.1 Summary of works addressed in this NIS

This NIS provides an assessment of noise impacts from activities associated with the operation of the Hunter Valley Precast Facility for the New M5 Motorway. The operational activities include:

- Delivery of materials to site
- Fabrication of precast segments
- Transportation of finished segments from site

2.2 Hours of operation

The Hunter Valley Precast Facility will operate within the standard daytime hours as defined by the INP:

- Day: 07:00-18:00 Monday to Friday and 08:00-13:00 Saturday

The facility will not operate outside of these hours.

2.3 Operational traffic

The precast site will generate additional traffic movements in the form of:

- Light vehicle movements generated by personnel travelling to and from work
- Heavy vehicle movements generated by:
  - Delivery vehicles bringing raw materials, plant, and equipment to the site
  - Trucks removing finished segments from the site
  - Concrete trucks bringing concrete to the site

Traffic generated within the precast facility site is included as part of the noise assessment of the work activities identified in Section 6. When operational traffic moves on the public road network, a different noise assessment methodology is appropriate as vehicle movements would be regarded as additional road traffic on public roads rather than as part of the site's operational activities. Traffic noise is addressed in Section 7.

2.4 Construction noise assessment

The subject site for the proposal area is an area of land that previously operated as a precast facility in 2010 to support construction of the Hunter Expressway project. Minimal site construction works would be required to reinstate the precast facility as the site is already established. Site construction works for the proposal would include:

- Re-instating fencing around the proposal area
- Installing site office facilities
- Inspection of existing facilities including waste water treatment facilities (septic tanks, sand filtration system and sediment basin) and completing any necessary repairs.

The impact of site construction works for the pre-cast facility will be minimal, and less than the impact of the operational activities discussed in Section 6.

3 Existing acoustic environment

Criteria for the assessment of operational noise are usually derived from the existing noise environment of an area, excluding noise from the subject development.

Appendix B of the NSW EPA *Industrial Noise Policy* (INP) outlines two methods for determining the background noise level of an area, being 'B1 – Long-term background noise method' and 'B2 – Short-term background noise method'. This assessment has used long-term noise monitoring.

As the noise environment of an area almost always varies over time, background and ambient noise levels need to be determined for the operational times of the proposed development. For example, in a suburban or urban area the noise environment is typically at its minimum at 3am in the morning and at its maximum during the morning and afternoon traffic peak hours. The INP outlines the following standard time periods over which the background and ambient noise levels are to be determined:

- Day: 07:00-18:00 Monday to Saturday and 08:00-18:00 Sundays & Public Holidays
- Evening: 18:00-22:00 Monday to Sunday & Public Holidays
- Night: 22:00-07:00 Monday to Saturday and 22:00-08:00 Sundays & Public Holidays

3.1 Noise measurement locations

Noise measurements are ideally carried out at the nearest or most potentially affected locations surrounding a development. An alternative, representative location should be established in the case of access restrictions or a safe and secure location cannot be identified. Furthermore, representative locations may be established in the case of multiple receivers as it is usually impractical to carry out measurements at all locations surrounding a site.

Long-term unattended noise monitoring was conducted at the closest residence to the Precast Facility (1416 George Booth Drive, Buchanan) over approximately one week to establish existing ambient and background levels. The monitor was installed in the free-field, approximately 30m from building, on the side closest to the facility.

The long-term measurement location is shown in Figure B1, APPENDIX B.

3.2 Long-term noise measurement results

Long-term noise monitoring was carried out from Wednesday, 12 October 2016 to Monday, 24 October 2016. The long-term noise monitoring methodology is detailed in APPENDIX D, and noise level-vs-time graphs of the data are included in APPENDIX E.

Table 3.1 presents the overall single Rating Background Levels (RBL) and representative ambient L_{eq} noise levels for each assessment period, determined in accordance with the INP.

Table 3.1: Long-term noise monitoring results, dB(A)

Monitoring location	L_{A90} Rating Background Level (RBL)			L_{Aeq} Ambient noise levels		
	Day	Evening	Night	Day	Evening	Night
L1 - 1416 George Booth Drive	39	41	36	50	48	46

Notes: Day: 07:00-18:00 Monday to Saturday and 08:00-18:00 Sundays & Public Holidays
Evening: 18:00-22:00 Monday to Sunday & Public Holidays
Night: 22:00-07:00 Monday to Saturday and 22:00-08:00 Sundays & Public Holidays
As required by the INP, the external ambient noise levels presented are free-field noise levels. [i.e. no façade reflection]

4 Nearest sensitive receivers

4.1 Residential receivers

An indicative list of the nearest and potentially worst affected residential receivers are summarised in Table 4.1 below.

Table 4.1: Nearest residential noise sensitive receivers

Receiver ID	Nearest residential receiver address	Approx. distance receiver boundary to works
R_01	1332 George Booth Drive, Buchanan	690m
R_02	1395 George Booth Drive, Buchanan	1100m
R_03	1408 George Booth Drive, Buchanan	765m
R_04	1413 George Booth Drive, Buchanan	1030m
R_05	CT1/1416 George Booth Drive, Buchanan	500m
R_06	CT3/1416 George Booth Drive, Buchanan	440m
R_07	CT4/1416 George Booth Drive, Buchanan	585m
R_08	1424 George Booth Drive, Buchanan	960m
R_09	1459 George Booth Drive, Buchanan	1220m
R_10	1490 George Booth Drive, Buchanan	1280m

All relevant residential sensitive receivers in the vicinity of the worksite are identified on aerial photographs located in APPENDIX B.

4.2 Other sensitive receivers

In addition to residential receivers, there are 'other' noise sensitive receivers (e.g. educational institutions, places of worship, recreational areas, etc.) surrounding the site that have been identified and are summarised in Table 4.2.

Table 4.2: Nearest 'other' noise sensitive receivers

Receiver ID	Land use	Other sensitive receiver address	Approx. distance to worksite
C_01	Industrial	Orica Kurri Technical Centre, 1151 George Booth Drive, Richmond Vale	765m
C_02	Industrial	Henholme, CT4/1416 George Booth Drive, Buchanan	540m

All relevant 'other' sensitive receivers near the worksite are identified on aerial photographs located in APPENDIX B.

5 Noise objectives

5.1 Operational noise criteria

The noise criteria used in the assessment of the operation of the Hunter Valley Precast Facility are set using the NSW Industrial Noise Policy (INP) [1]. The NSW Industrial Noise Policy assessment has two components:

- Controlling intrusive noise impacts in the short-term for residences; and
- Maintaining noise level amenity for particular land uses for residences and other land uses.

5.1.1 Intrusive noise criteria

The intrusiveness criteria is applicable to residential premises only. According to the INP, the intrusiveness of a noise source may generally be considered acceptable if the equivalent continuous (energy-average) A-weighted level of noise from the source (represented by the L_{Aeq} descriptor) does not exceed the background noise level measured in the absence of the source by more than 5dB(A).

The intrusiveness criterion is summarised as follows:

- $L_{Aeq,15minute} \leq$ Rating Background Level (RBL) plus 5dB

5.1.2 Amenity noise criteria

The INP amenity criteria are designed to maintain noise level amenity for particular land uses, including residential and other land uses. The INP recommends base acceptable noise levels for various receivers, including residential, commercial, industrial receivers and other sensitive receivers in Table 2.1 of the INP. Noise from new sources need to be designed such that the cumulative effect does not produce levels that would significantly exceed the criterion.

Table 5.1: INP Amenity Criteria - Recommended L_{Aeq} noise levels from industrial noise sources [NSW INP Table 2.1]

Type of receiver	Indicative Noise Amenity Area	Time of day	Recommended $L_{Aeq(Period)}$ noise level	
			Acceptable	Recommended maximum
Residence	Rural	Day	50	55
		Evening	45	50
		Night	40	45
Industrial premises	All	When in use	70	75

Note:

Daytime 7.00 am to 6.00 pm; Evening 6.00 pm to 10.00 pm; Night-time 10.00 pm to 7.00 am

On Sundays and Public Holidays, Daytime 8.00 am - 6.00 pm; Evening 6.00 pm - 10.00 pm; Night-time 10.00 pm - 8.00 am.

The LAeq index corresponds to the level of noise equivalent to the energy average of noise levels occurring over a measurement period.

5.1.3 Project operational noise criteria

The most stringent criteria of the intrusive noise criteria and the amenity noise criteria are chosen as the noise criteria applying to the project. Table 5.2 below summarises the project noise criteria.

Table 5.2: Project noise criteria

Receiver type	Noise criteria (day) ($L_{Aeq,15min}$)
Residential (rural)	39 + 5 = 44dB(A) (intrusiveness)
Industrial	70dB(A)

5.2 Operation related road traffic noise criteria

The noise criteria used in the assessment of the traffic generated by the operation of the Hunter Valley Precast Facility are set using the NSW Road Noise Policy (RNP) [2].

Table 5.3 sets out the assessment criteria for residences to be applied to particular types of project, road category and land use. These criteria are for assessment against façade corrected noise levels when measured in front of a building façade. In Table 5.3, freeways, arterial roads and sub-arterial roads are grouped together and attract the same criteria.

Table 5.3: Road traffic noise assessment criteria for residential land uses

Road category	Type of project/land use	Assessment criteria – dB(A)	
		Day 7:00am-10:00pm	Night 10:00pm-7:00am
Freeway/ arterial/ sub-arterial roads	1. Existing residences affected by noise from new freeway/arterial/sub-arterial road corridors	$L_{Aeq,(15\ hour)}$ 55 (external)	$L_{Aeq,(9\ hour)}$ 50 (external)
	2. Existing residences affected by noise from redevelopment of existing freeway / arterial / sub-arterial roads	$L_{Aeq,(15\ hour)}$ 60 (external)	$L_{Aeq,(9\ hour)}$ 55 (external)
	3. Existing residences affected by additional traffic on existing freeways / arterial / sub-arterial roads generated by land use developments	$L_{Aeq,(15\ hour)}$ 60 (external)	$L_{Aeq,(9\ hour)}$ 55 (external)
Local roads	4. Existing residences affected by noise from new local road corridors	$L_{Aeq,(1\ hour)}$ 55 (external)	$L_{Aeq,(1\ hour)}$ 50 (external)
	5. Existing residences affected by noise from redevelopment of existing local roads		
	6. Existing residences affected by additional traffic on existing local roads generated by land use developments		

Note: Land use developers must meet internal noise goals in the Infrastructure SEPP (Department of Planning NSW 2007) for sensitive developments near busy roads (see Appendix C10).

Where existing traffic noise levels are above the noise assessment criteria, the primary objective is to reduce these through feasible and reasonable measures to meet the assessment criteria. A secondary objective is to protect against excessive decreases in amenity as the result of a project by applying the relative increase criteria.

In assessing feasible and reasonable mitigation measures, an increase of up to 2dB represents a minor impact that is considered barely perceptible to the average person.

For existing residences and other sensitive land uses affected by *additional traffic on existing roads generated by land use developments*, any increase in the total traffic noise level (where the assessment criteria cannot be achieved) should be limited to 2dB above that of the corresponding 'no build option'.

This assessment is of the noise impact on existing residences caused by additional traffic generated by a new land use development. George Booth Drive is considered a sub-arterial road. Therefore this assessment uses the category 3 daytime criterion: 60dB(A) $L_{Aeq,(15hour)}$.

6 Operational noise assessment

6.1 Noise prediction methodology

Modelling and assessment of airborne noise impacts from activities associated with the works were determined by modelling the noise sources, receiver locations, topographical features, and possible noise mitigation measures using a Cadna-A computer noise model developed for this project. The model calculates the contribution of each noise source at identified sensitive receiver locations and allows for the prediction of the total noise from a site for the various stages of the works.

The noise prediction models consider:

- Location of noise sources and sensitive receiver locations.
- Height of sources and receivers referenced to one metre digital ground contours for the site area and surrounding area.
- Sound Power Levels (L_w) of plant and equipment likely to be used during operation (see Table C1 in APPENDIX C).
- Separation distances between sources and receivers.
- Ground type between sources and receivers.
- Attenuation from barriers (natural and purpose built).

Key details regarding the site layout, the likely plant and equipment (including truck movements), and hours of operation were informed by the Design Team. This information is presented in APPENDIX C and formed the basis for all modelling assumptions used in this assessment.

The modelling of the operation of the precast facility includes combinations of items of plant considered to be representative of typical worst-case operation.

6.2 Predicted noise levels

Noise emissions were determined by modelling the noise sources, receiver locations, and operating activities, based on the information presented in APPENDIX C. Predicted L_{Aeq} noise levels from the sites are presented in Table 6.1 below for all receivers. The predictions are representative of noise levels during the works.

Table 6.1: Predicted noise levels

Receiver ID	Address	Predicted noise level - dB(A), $L_{Aeq,(15min)}$	INP Noise criteria - dB(A)
R_01	1332 George Booth Drive, Buchanan	43	44
R_02	1395 George Booth Drive, Buchanan	33	44
R_03	1408 George Booth Drive, Buchanan	43	44
R_04	1413 George Booth Drive, Buchanan	34	44
R_05	1/1416 George Booth Drive, Buchanan	**49**	44
R_06	3/1416 George Booth Drive, Buchanan	**50**	44
R_07	4/1416 George Booth Drive, Buchanan	**46**	44
R_08	1424 George Booth Drive, Buchanan	36	44
R_09	1459 George Booth Drive, Buchanan	32	44
R_10	1490 George Booth Drive, Buchanan	31	44
C_01	1151 George Booth Drive, Richmond Vale	38	70
C_02	4/1416 George Booth Drive, Buchanan	48	70

Note: **Bold** text indicates an exceedance of the noise criteria

Modelling indicates that at some times there may be minor exceedances of the noise criteria, depending on what plant/ equipment are operating at the time. CDS JV advises that the residences where the exceedances are occurring are owned by the owner of the land leased by the precast facility. It is therefore considered unlikely that there will be any complaints due to operation of the facility.

In the event of complaints, mitigation measures such as staggered operation of equipment or the erection of noise barriers can be considered after verification noise monitoring has been conducted.

Some general noise management measures are presented in Section 6.3.1.

6.3 Noise mitigation and management

6.3.1 Other noise control measures

The following at-source control measures are recommended to reduce potential noise impacts:

Table 6.2: Site noise control measures

Control type	Control measure	Typical use
At-Source Control Measures	Noise control kits	Plant that is brought to site should meet the sound power limits identified in Table C1. Where plant exceeds limits then the plant may require installation of 'noise control kits' in order to comply with the noise limits set in Table C1. Such 'noise control kits' comprise: • high performance 'residential-grade' exhaust mufflers, • additional engine cowling / enclosure lined inside with sound absorbent industrial-grade foam, and • air intake and discharge silencers / louvres. The requirement of fitting 'noise control kits' onto the identified plant, shall be confirmed once each plant is tested prior to its regular use on site.

Control type	Control measure	Typical use
Noise Management Measures	Limit equipment in use	Only the equipment necessary during each stage of the works will be used.
	Timing of equipment in use	Where practicable, activities and plant will be limited as outlined in Table C1 (APPENDIX C).
	Limit activity duration	Any equipment not in use for extended periods shall be switched off. For example, heavy vehicles should switch engines off when not in use.
	Use and siting of plant	Avoid/ limit simultaneous operation of noisy plant and equipment within discernible range of a sensitive receiver. Direct noise-emitting plant away from sensitive receivers where practicable. Locate fixed location plant items as far from sensitive receivers as practicable.
	Equipment selection	Use quieter and less noise emitting methods where feasible and reasonable.
	Non-tonal reversing alarms	Alternatives reverse alarm, such as 'quackers' will be installed on all plant and equipment, where practicable.
	Site inductions & Toolbox Talks	All employees, contractors and subcontractors are to receive a Project induction. The environmental component may be covered in toolboxes and should include: • location of nearest sensitive receivers • relevant project specific and standard noise mitigation measures; • permissible hours of work; • Work Procedure and Form • employee parking areas.
	Community consultation	Inform community of activity and potential impacts.
	Behavioural practices	No swearing or unnecessary shouting or loud stereos/radios on site. No dropping of materials from height, throwing of metal items and slamming of doors.
	Noise monitoring	Noise monitoring is to be carried out as detailed in Section 6.3.2.

6.3.2 Attended noise monitoring

Attended noise monitoring is to be undertaken to verify that noise levels resulting from works are in accordance with the levels predicted in this NIS, subject to obtaining the property owner/occupier's consent to access the property (where required).

It is recommended that noise monitoring is conducted at the following location:

- CT3/1416 George Booth Drive, Buchanan - within 30m of the building, on the side closest to the precast facility.

Noise monitoring should follow the procedures outlined in Appendix F of the WestConnex Stage 2 Construction Noise and Vibration Management Plan (CNVMP) [3]. Note that monitoring at all properties may be undertaken from the property boundary to limit any inconvenience to property owners.

6.3.3 Complaints handling

Noise complaints received and responded to will be managed in accordance with the CNVMP [3] and Construction Complaints Management System.

Sydney Motorway Corporation (SMC) operate a 24-hour construction complaints line (1800 660 248). Enquiries/ complaints may also be received through the New M5 project email (info@westconnex.com.au).

7 Traffic noise assessment

7.1 Traffic sources

All heavy vehicles will access the Hunter Valley Precast Facility from George Booth Drive via the Hunter Expressway (M15) to the north.

Traffic noise impacts are not considered on the M15 as it is a major arterial road. Traffic noise impacts have therefore only been calculated along George Booth Drive as there are residential receivers along the truck route.

Details of projected heavy vehicle movements associated with the works were provided by CDS JV. Light vehicle movements were not considered to be significant.

Traffic volumes were provided by Jacobs, and are detailed in Table 7.1.

Table 7.1: Traffic noise modelling data - existing road network

Road	Road category (RNP)	15-hour day period (7am-10pm)			
		Existing		Project	
		TOTAL	HV	TOTAL	HV
George Booth Drive (north of access road)	Sub-arterial	706	51	45	20

7.2 Predicted traffic noise

The potential impact of road traffic noise to nearby residential receivers has been estimated using the United Kingdom Department of Environment's 'Calculation of Road Traffic Noise' (1988) method. The method uses the average 1-hour traffic volume for the 'assessment period' (i.e. day or night) to predict the $L_{10,\ 1hour}$ noise levels. A correction of -3dB(A) is applied to obtain the $L_{eq,\ 1\ hour}$ noise levels which equate to the L_{Aeq} noise levels for the 'assessment period'.

For the purpose of this assessment the model has taken into account:

- traffic volume and heavy vehicle forecasts;
- vehicle speed;
- road gradient;
- ground reference levels of the road and receivers;
- separation distances of the road to receivers (assumed 15m setback);
- ground type between the road and receivers; and

- angles of view of the road from the receiver's position.

For assessment purposes, residential receivers are assumed to be a typical worst-case distance of 15m from the road.

Table 7.2 below summarises the predicted traffic noise levels during day and night periods.

Table 7.2: Predicted traffic noise levels (with/ without construction)

Road	Predicted noise level, dB(A)			
	Day period (7am to 10pm)			RNP Noise Criteria
	Noise descriptor	No precast facility	With precast facility	
George Booth Drive	$L_{Aeq(15h)}$	52.0	53.3	60

Note: **Bold text** indicates more than 2dB(A) increase in traffic noise levels resulting from traffic.

The predicted road traffic noise levels are below the RNP noise criteria and indicate a traffic noise increase of <2dB(A) in overall day $L_{Aeq(15h)}$ caused by the addition of precast facility traffic. Therefore, the precast facility will have minimal impact on traffic noise generated to residences on George Booth Drive and are found to satisfy the traffic noise criteria identified in Section 5.2.

7.3 Traffic noise mitigation and management

None required when on public roads, provided hourly traffic movements associated with operation of the precast facility are consistent with the assumptions outlined above. The New M5 Project has incorporated a Heavy Vehicle Code of Conduct to assist in managing impacts associated with heavy vehicles on public roads. It includes several measures, including limiting of compression braking, which will ensure that noise impacts of heavy vehicle traffic on surrounding streets are minimised. The Heavy Vehicle Code of Conduct will be applied to the operation of the Hunter Valley Precast Facility.

8 Conclusion

In conclusion, works associated with the operation of the Hunter Valley Precast Facility have been identified and described in this report. The potentially affected noise sensitive receivers and relevant noise objectives have been identified and discussed to allow the assessment of potential noise impacts.

The expected noise levels from the operation of the facility have been predicted and presented in Section 6.2. Noise levels will comply with the noise objectives, with the exception of the noted exceedances at the three residences closed to the precast facility, where there is potential for exceedance of the noise criteria of up to 4 dB(A). It is understood that these properties are owned by the owner of the land the precast facility occupies.

Noise mitigation and management measures have been presented in Section 6.3 to aid in providing additional noise reduction benefits where exceedance of the objective occurs.

Traffic noise generated by the precast facility on the local road network has been assessed in Section 7. Traffic noise levels are predicted to comply with the noise objectives.

References

1. NSW Industrial Noise Policy, Environmental Protection Authority, 2000.
2. NSW Road Noise Policy, Department of Environment, Climate Change and Water NSW, 2011.
3. WestConnex New M5 Construction Noise and Vibration Management Plan (TH014-05 01F01 WCX_NM5 CNVMP)
4. AECOM Australia Pty Ltd 2015 WestConnex The New M5 project - Technical Working Paper: Noise and Vibration Revision 8 – 20-Nov-2015

APPENDIX A Glossary of terminology

The following is a brief description of the technical terms used to describe noise to assist in understanding the technical issues presented.

Absorption Coefficient α	The absorption coefficient of a material, usually measured for each octave or third-octave band and ranging between zero and one. For example, a value of 0.85 for an octave band means that 85% of the sound energy within that octave band is absorbed on coming into contact with the material. Conversely, a low value below about 0.1 means the material is acoustically reflective.
Adverse weather	Weather effects that enhance noise (particularly wind and temperature inversions) occurring at a site for a significant period of time. In the NSW INP this occurs when wind occurs for more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of nights in winter.
Active recreation	Active recreation area, characterised by sporting activities and activities which generate their own noise or focus for participants, making them less sensitive to external noise intrusion, e.g. school playground, golf course
Air-borne noise	Noise which is fundamentally transmitted by way of the air and can be attenuated by the use of barriers and walls placed physically between the noise source and receiver.
Alternate Solution	An Alternative Solution is a design that complies with the relevant Performance Requirements of the National Construction Code other than by using Deemed-to-Satisfy Provisions.
Ambient noise	The all-encompassing noise associated within a given environment at a given time, usually composed of sound from all sources near and far.
Amenity	A desirable or useful feature or facility of a building or place.
AS	Australian Standard
Assessment period	The time period in which an assessment is made. e.g. Day 7am-6pm, Evening 6pm-10pm, Night 10pm-7am.
Assessment Point	A location at which a noise or vibration measurement is taken or estimated.
Attenuation	The reduction in the level of sound or vibration.
Audible Range	The limits of frequency which are audible or heard as sound. The normal hearing in young adults detects ranges from 20 Hz to 20 kHz, although some people can detect sound with frequencies outside these limits.
A-weighting	A filter applied to the sound recording made by a microphone to approximate the response of the human ear.
Background noise	Background noise is the term used to describe the underlying level of noise present in the ambient noise, measured in the absence of the noise under investigation. It is described as the average of the minimum noise levels measured on a sound level meter and is measured statistically as the A-weighted noise level exceeded for ninety percent of a sample period. This is represented as the LA90 noise level if measured as an overall level or an L90 noise level when measured in octave or third-octave bands.
Barrier (Noise)	A natural or constructed physical barrier which impedes the propagation of sound and includes fences, walls, earth mounds or berms and buildings.
Berm	Earth or overburden mound.
Buffer	An area of land between a source and a noise-sensitive receiver and may be an open space or a noise-tolerant land use.
Bund	A bund is an embankment or wall of brick, stone, concrete or other impervious material, which may form part or all of the perimeter of a compound.
BS	British Standard
CoRTN	United Kingdom Department of Environment entitled "Calculation of Road Traffic Noise (1988)"

Decibel [dB]	The units of sound measurement. The following are examples of the decibel readings of every day sounds: 0dB The faintest sound we can hear, defined as 20 micro Pascal 30dB A quiet library or in a quiet location in the country 45dB Typical office space. Ambience in the city at night 60dB CBD mall at lunch time 70dB The sound of a car passing on the street 80dB Loud music played at home 90dB The sound of a truck passing on the street 100dB The sound of a rock band 115dB Limit of sound permitted in industry 120dB Deafening
dB(A)	A-weighted decibel. The A- weighting noise filter simulates the response of the human ear at relatively low levels, where the ear is not as effective in hearing low frequency sounds as it is in hearing high frequency sounds. That is, low frequency sounds of the same dB level are not heard as loud as high frequency sounds. The sound level meter replicates the human response of the ear by using an electronic filter which is called the "A" filter. A sound level measured with this filter is denoted as dB(A). Practically all noise is measured using the A filter.
dB(C)	C-weighted decibels. The C-weighting noise filter simulates the response of the human ear at relatively high levels, where the human ear is nearly equally effective at hearing from mid-low frequency (63Hz) to mid-high frequency (4kHz), but is less effective outside these frequencies. The dB(C) level is not widely used but has some applications.
Diffraction	The distortion of sound waves caused when passing tangentially around solid objects.
DIN	German Standard
DnT,w	Weighted Standardised Field Level Difference A measure of sound insulation performance of a building element. It is characterised by the difference in noise level on each side of a wall or floor. It is measured in-situ. It is a field measurement that relates to the Rw laboratory measured value but is not equal to it because an in-situ space is not of the same quality as a laboratory space. The value is indicative of the level of speech privacy between spaces. The higher its value the better the insulation performance.
ECRTN	Environmental Criteria for Road Traffic Noise, NSW, 1999
EPA	Environment Protection Authority
Field Test	A test of the sound insulation performance in-situ. See also 'Laboratory Test' The sound insulation performance between building spaces can be measured by conducting a field test, for example, early during the construction stage or on completion. A field test is conducted in a non-ideal acoustic environment. It is generally not possible to measure the performance of an individual building element accurately as the results can be affected by numerous field conditions.
Fluctuating Noise	Noise that varies continuously to an appreciable extent over the period of observation.
Free-field	An environment in which there are no acoustic reflective surfaces. Free field noise measurements are carried out outdoors at least 3.5m from any acoustic reflecting structures other than the ground.
Frequency	Frequency is synonymous to pitch. Sounds have a pitch which is peculiar to the nature of the sound generator. For example, the sound of a tiny bell has a high pitch and the sound of a bass drum has a low pitch. Frequency or pitch can be measured on a scale in units of Hertz or Hz.
Ground-borne noise	Vibration propagated through the ground and then radiated as noise by vibrating building elements such as wall and floor surfaces. This noise is more noticeable in rooms that are well insulated from other airborne noise. An example would be vibration transmitted from an underground rail line radiating as sound in a bedroom of a building located above.

Habitable Area	Includes a bedroom, living room, lounge room, music room, television room, kitchen, dining room, sewing room, study, playroom, family room, home theatre and sunroom. Excludes a bathroom, laundry, water closet, pantry, walk-in wardrobe, corridor, hallway, lobby, photographic darkroom, clothes drying room, and other spaces of a specialised nature occupied neither frequently nor for extended periods.
Heavy Vehicle	A truck, transporter or other vehicle with a gross weight above a specified level (for example: over 8 tonnes).
Impact Noise	The noise in a room, caused by impact or collision of an object onto the walls or the floor. Typical sources of impact noise are footsteps on the floor above a tenancy and the slamming of doors on cupboards mounted on the common wall between tenancies.
Impulsive noise	Having a high peak of short duration or a sequence of such peaks. A sequence of impulses in rapid succession is termed repetitive impulsive noise.
INP	NSW Industrial Noise Policy, EPA 1999
Intermittent noise	The level suddenly drops to that of the background noise several times during the period of observation. The time during which the noise remains at levels different from that of the ambient is one second or more.
Intrusive noise	Refers to noise that intrudes above the background level by more than 5dB(A).
ISEPP	State Environmental Planning Policy (Infrastructure), NSW, 2007
ISEPP Guideline	Development Near Rail Corridors and Busy Roads - Interim Guideline, NSW Department of Planning, December 2008
L1	The sound pressure level that is exceeded for 1% of the time for which the given sound is measured.
L10	The sound pressure level that is exceeded for 10% of the time for which the given sound is measured.
L10(1hr)	The L10 level measured over a 1-hour period.
L10(18hr)	The arithmetic average of the L10(1hr) levels for the 18-hour period between 6am and 12 midnight on a normal working day.
L90	The level of noise exceeded for 90% of the time. The bottom 10% of the sample is the L90 noise level expressed in units of dB(A).
LAeq or Leq	The "equivalent noise level" is the summation of noise events and integrated over a selected period of time, which would produce the same energy as a fluctuating sound level. When A-weighted, this is written as the LAeq.
LAeq(1hr)	The LAeq noise level for a one-hour period. In the context of the NSW EPA's Road Noise Policy it represents the highest tenth percentile hourly A-weighted Leq during the period 7am to 10pm, or 10pm to 7am (whichever is relevant).
LAeq(8hr)	The LAeq noise level for the period 10pm to 6am.
LAeq(9hr)	The LAeq noise level for the period 10pm to 7am.
LAeq(15hr)	The LAeq noise level for the period 7am to 10pm.
LAeq (24hr)	The LAeq noise level during a 24-hour period, usually from midnight to midnight.
Lmax	The maximum sound pressure level measured over a given period. When A-weighted, this is usually written as the LAmax.
Lmin	The minimum sound pressure level measured over a given period. When A-weighted, this is usually written as the LAmin.
Ln,w	Weighted Normalised Impact Sound Pressure Level A measure of the sound level transmitted from impacts on a floor to a tenancy below. It is measured in very controlled conditions in a laboratory and is characterised by how much sound reaches the receiving room from a standard tapping machine. A lower value indicates a better performing floor.

LnT,w	Weighted Standardised Field Impact Sound Pressure Level As for Ln,w but measured in-situ and therefore subject to the inherent accuracies involved in such a measurement. The equivalent measurement in a laboratory is the Ln,w. A lower value indicates a better performing floor.
Laboratory Test	The performance of a building element when measured in a laboratory. The sound insulation performance of a building element installed in a building however can differ from its laboratory performance for many reasons including the quality of workmanship, the size and shape of the space in which the measurement is conducted, flanking paths and the specific characteristics of the material used which may vary from batch to batch.
Loudness	A rise of 10 dB in sound level corresponds approximately to a doubling of subjective loudness. That is, a sound of 85 dB is twice as loud as a sound of 75 dB which is twice as loud as a sound of 65 dB and so on. That is, the sound of 85 dB is four times or 400% the loudness of a sound of 65 dB.
Microphone	An electro-acoustic transducer which receives an acoustic signal and delivers a corresponding electric signal.
NCA	Noise Catchment Area. An area of study within which the noise environment is substantially constant.
Noise	Unwanted sound
NRC	Noise Reduction Coefficient. A measure of the ability of a material to absorb sound. The NRC is generally a number between 0 and 1 but in some circumstances can be slightly greater than 1 because of absorption at the edges of the material. A material with an NRC rating of 1 absorbs 100% of incoming sound, that is, no sound is reflected back from the material. The NRS is the average of the absorption coefficient measured in the octave bands 250Hz, 500Hz, 1kHz & 2kHz which correspond to the predominant frequencies associated with the human voice.
Passive recreation	Area specifically reserved for passive recreation, characterised by contemplative activities that generate little noise and where benefits are compromised by external noise intrusion e.g. reading, meditation
Reflection	Sound wave reflected from a solid object obscuring its path.
Reverberation Time	The time (in seconds) it takes for a noise signal within a confined space to decay by 60dB. The longer the reverberation time (usually denoted as RT60), the more echoic a room. Longer reverberation times generally result in higher noise levels within spaces.
RMS	Root Mean Square value representing the average value of a signal.
Rw	Weighted Sound Reduction Index A measure of the sound insulation performance of a building element. It is measured in very controlled conditions in a laboratory. The term supersedes the value STC which was used in older versions of the Building Code of Australa. Rw is measured and calculated using the procedure in ISO 717-1. The related field measurement is the DnT,w. The higher the value the better the acoustic performance of the building element.
R'w	Weighted Apparent Sound Reduction Index. As for Rw but measured in-situ and therefore subject to the inherent accuracies involved in such a measurement. The higher the value the better the acoustic performance of the building element.
RNP	Road Noise Policy, NSW, March 2011
SEL	Sound Exposure Level (SEL) is the constant sound level which, if maintained for a period of 1 second would have the same acoustic energy as the measured noise event. SEL noise measurements are useful as they can be converted to obtain Leq sound levels over any period of time and can be used for predicting noise at various locations.
Sound	A fluctuation of air pressure which is propagated as a wave through air.

Sound absorption	The ability of a material to absorb sound energy by conversion to thermal energy.
Sound Insulation	Sound insulation refers to the ability of a construction or building element to limit noise transmission through the building element. The sound insulation of a material can be described by the Rw and the sound insulation between two rooms can be described by the DnT,w.
Sound level meter	An instrument consisting of a microphone, amplifier and indicating device, having a declared performance and designed to measure sound pressure levels.
Sound power level	Ten times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power of 1 pico watt.
Sound pressure level	The level of noise, usually expressed in decibels, as measured by a standard sound level meter with a microphone referenced to 20 mico Pascal.
Spoil	Soil or materials arising from excavation activities.
Standardised	A method of adjusting the measured noise indices in-situ so that they are independent of the measuring space. The noise level in a room is affected by reverberation in the room. For example, the L'n,w impact sound pressure level measured in a room is dependent upon the amount of absorptive material in the receiving room. The value is adjusted to what would be measured if the reverberation time in the receiving room is set at 0.5 seconds. This enables the same value to be reported independent of whether the room contains carpet and furnishings and the like. See also 'Normalised'.
STC	Sound Transmission Class A measure of the sound insulation performance of a building element. It is measured in controlled conditions in a laboratory. The term has been superseded by Rw.
Structure-borne Noise	Audible noise generated by vibration induced in the ground and/or a structure. Vibration can be generated by impact or by solid contact with a vibrating machine. Structure-borne noise cannot be attenuated by barriers or walls but requires the isolation of the vibration source itself. This can be achieved using a resilient element placed between the vibration source and its support such as rubber, neoprene or springs or by physical separation (using an air gap for example). Examples of structure-borne noise include the noise of trains in underground tunnels heard to a listener above the ground, the sound of footsteps on the floor above a listener and the sound of a lift car passing in a shaft. See also 'Impact Noise'.
Tonal Noise	Sound containing a prominent frequency and characterised by a definite pitch.
Transmission Loss	The sound level difference between one room or area and another, usually of sound transmitted through an intervening partition or wall. Also the vibration level difference between one point and another. For example, if the sound level on one side of a wall is 100dB and 65dB on the other side, it is said that the transmission loss of the wall is 35dB. If the transmission loss is normalised or standardised, it then becomes the Rw or R'w or DnT,w.

APPENDIX B Nearest sensitive receivers

Legend:

- Residential building
- Industrial building
- Work site
- Noise monitoring location L1

Consultant:

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Acoustics, Vibration & Structural Dynamics

1/418A Elizabeth Street, SURRY HILLS NSW 201
P: 02 8218 0500 F: 02 8218 0501

Client:

WestConnex New M5
CPB CONTRACTORS | DRAGADOS | SAMSUNG C&T

Project:

WESTCONNEX NEW M5
HUNTER VALLEY PRECAST FACILITY

Description:

FIGURE B1:
SITE AERIAL AND RECEIVERS

Project No.:	TH014-09	Created by:	JB
Fig Ref:	TH014-09 5.3.01 Pre-cast Facility (r0)		
Date:	08.11.16	Scale:	1: 6613 A3

APPENDIX C Precast facility activities and noise sources

Table C1: Operation timetable/ activities/ equipment **Hunter Valley Pre-cast Facility**

Activity/ Work Area	Aspect	Plant/ Equipment	Net Power kW	Operating Weight kg	Day	Evening	Night	Sound Power Level (Lw re: 1pW) in Noise		Notes
					7am - 6pm	6pm - 10pm	10pm - 7am	L_{Aeq}	L_{A1}	
WestConnex - Precast yard equipment	General/ minor equipment	125CFU COMPRESSORS			2	-	-	109		Not used with water blasters
		3000PSI WATER BLASTER			2	-	-	91		Not used with compressors
		EXTERNAL FORM VIBRATORS			36	-	-	93		Half an hour only, by themselves
		POKER VIBRATOR - MEDIUM			4	-	-	106		
		WELD SETS			4	-	-	96		
		TRUCK PUMP HIRE			1	-	-	99		Hire, for afternoon pours
	Small hand tools	7" GRINDER			3	-	-	108		
		HILTI DRILL			3	-	-	105		
		SKILL SAW			3	-	-	112		
	Cranage	35TN CRANE			1	-	-	98		Start up and demobilisation only
		FORKLIFT 10t		10t	1	-	-	107		Always in use
	Transport	Light vehicles - staff/Labour			25 per day	-	-	88		Arrive at start and leave at end of day
		SITE PICKUPS			4 per day	-	-	108		
		WORKSHOP VEHICLE			1	-	-	88		
	Access equipment	SCISSOR LIFT			2	-	-	98		Always in use
	Gensets	25kVa GENERATORS	25kVA		2	-	-	92		Always in use
		100kVa GENERATORS - Offices	100kVA		1	-	-	94		Always in use
		450kVa GENERATORS - Factory	450kVA		1	-	-	105		Always in use
	Precast moulds	Hydraulic Pump			3	-	-	-		No mechanical noise
	Reinforcement equipment	EQUIP FOR TABLES			3	-	-	-		No mechanical noise
	Straddle carrier	110T Straddle Carrier			1	-	-	95		Always in use
	Gantry cranes	15T GANTRY		15t	2	-	-	92		Always in use
		10T GANTRY		10t	1	-	-	92		Always in use
	Deliveries - regular	CONCRETE DELIVERY TRUCK			12 per day	-	-	108		
		REBAR DELIVERY TRUCK			1 per day	-	-	108		Sit on site (engine off) 2-3 hours
	Deliveries - miscellaneous	DELIVERY TRUCKS			3 per day	-	-	108		Misc. and variable

APPENDIX D Noise monitoring methodology

D.1 Noise monitoring equipment

A long-term unattended noise monitor consists of a sound level meter housed inside a weather resistant enclosure. Noise levels are monitored continuously with statistical data stored in memory for every 15-minute period.

Long term noise monitoring was conducted using the following instrumentation:

Description	Type	Octave band data	Logger location(s)
RTA07 (NTi Audio XL2, with low noise microphone)	Type 1	1/3	1

Notes: All meters comply with AS IEC 61672.1 2004 "Electroacoustics - Sound Level Meters" and designated either Type 1 or Type 2 as per table, and are suitable for field use.

The equipment was calibrated prior and subsequent to the measurement period using a Bruel & Kjaer Type4231 calibrator. No significant drift in calibration was observed.

D.2 Meteorology during monitoring

Measurements affected by extraneous noise, wind (greater than 5m/s) or rain were excluded from the recorded data in accordance with the NSW INP. Determination of extraneous meteorological conditions was based on data provided by the Bureau of Meteorology (BOM), for a location considered representative of the noise monitoring location(s). However, the data was adjusted to account for the height difference between the BOM weather station, where wind speed and direction is recorded at a height of 10m above ground level, and the microphone location, which is typically 1.5m above ground level (and less than 3m). The correction factor applied to the data is based on Table C.1 of ISO 4354:2009 '*Wind actions on structures*'.

D.3 Noise vs time graphs

Noise almost always varies with time. Noise environments can be described using various descriptors to show how a noise ranges about a level. In this report, noise values measured or referred to include the L_{10}, L_{90}, and L_{eq} levels. The statistical descriptors L_{10} and L_{90} measure the noise level exceeded for 10% and 90% of the sample measurement time. The L_{eq} level is the equivalent continuous noise level or the level averaged on an equal energy basis. Measurement sample periods are usually ten to fifteen minutes. The Noise -vs- Time graphs representing measured noise levels, as presented in this report, illustrate these concepts for the broadband dB(A) results.

APPENDIX E Noise monitoring graphs

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Background & Ambient Noise Monitoring Results - NSW 'Industrial Noise Policy', 2000

	L_{A90} Background Noise Levels[4]			L_{Aeq} Ambient Noise Levels		
Date	**Day[1]**	**Evening[2]**	**Night[3]**	**Day[1]**	**Evening[2]**	**Night[3]**
Wednesday-12-October-2016	-	42.4	29.7	-	48.1	43.7
Thursday-13-October-2016	-	37.1	34.3	-	44.1	43.5
Friday-14-October-2016	39.3	42.3	37.5	49.8	46.0	46.0
Saturday-15-October-2016	38.9	40.9	36.6	46.5	47.0	47.5
Sunday-16-October-2016	-	41.1	38.5	-	46.1	46.8
Monday-17-October-2016	-	36.4	34.8	-	45.7	47.0
Tuesday-18-October-2016	41.2	40.0	36.1	47.2	46.6	47.9
Wednesday-19-October-2016	36.1	40.1	34.9	47.2	45.3	45.8
Thursday-20-October-2016	44.6	41.3	37.3	49.0	47.1	46.5
Friday-21-October-2016	41.2	43.5	39.4	49.4	49.0	47.8
Saturday-22-October-2016	-	44.3	36.8	-	51.8	47.6
Sunday-23-October-2016	39.1	37.1	35.8	54.7	47.8	44.7
Monday-24-October-2016	-	-	-	-	-	-
Representative Weekday[5]	**41**	**41**	**36**	**49**	**47**	**46**
Representative Weekend[5]	**39**	**41**	**37**	**52**	**49**	**47**
Representative Week[5]	**39**	**41**	**36**	**50**	**48**	**46**

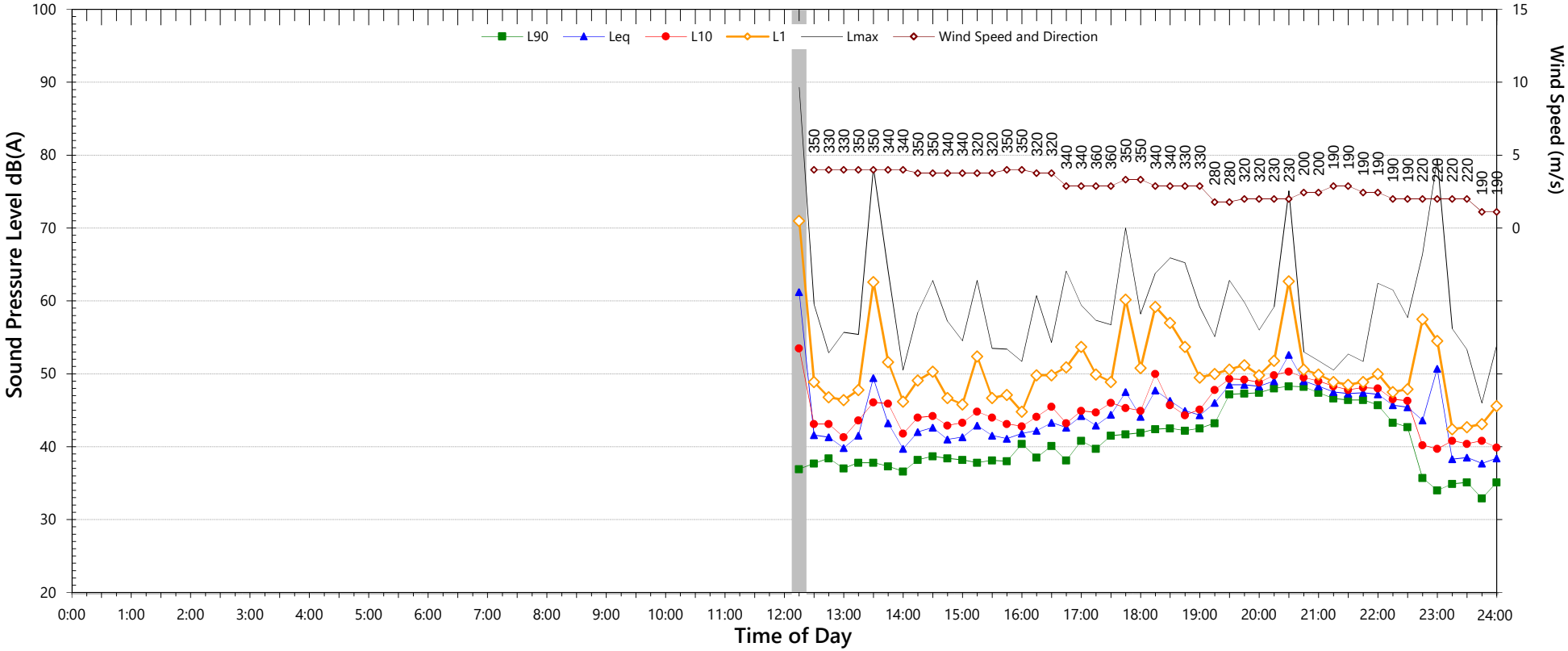
Notes:

1. Day is 8:00am to 6:00pm on Sunday and 7:00am to 6:00pm at other times
2. Evening is 6:00pm to 10:00pm
3. Night is the remaining periods
4. Assessment Background Level (ABL) for individual days
5. Rating Background Level (RBL) for L_{A90} and logarithmic average for L_{Aeq}
6. Leq is calculated in the free field. 2.5dB is subtracted from results if logger is placed at facade

Unattended Noise Monitoring Results

1416 George Booth Drive

Wednesday, 12 October 2016



NSW Industrial Noise Policy (Free Field)			
Descriptor	Day[2]	Evening[3]	Night[4 5]
L_{90}	-	42.4	29.7
LAeq	-	48.1	43.7

NSW Road Noise Policy (1m from facade)		(see note 6)
Descriptor	Day	Night[5]
	7am-10pm	10pm-7am
$L_{eq\ 15\ hr}$ and $L_{eq\ 9\ hr}$	48.5	46.2
$L_{eq\ 1hr}$ upper 10 percentile	52.6	51.9
$L_{eq\ 1hr}$ lower 10 percentile	43.5	37.5

Night Time Maximum Noise Levels			(see note 7)
L_{Max} (Range)	65.4	to	85.2
L_{Max} - L_{eq} (Range)	17.4	to	35.8

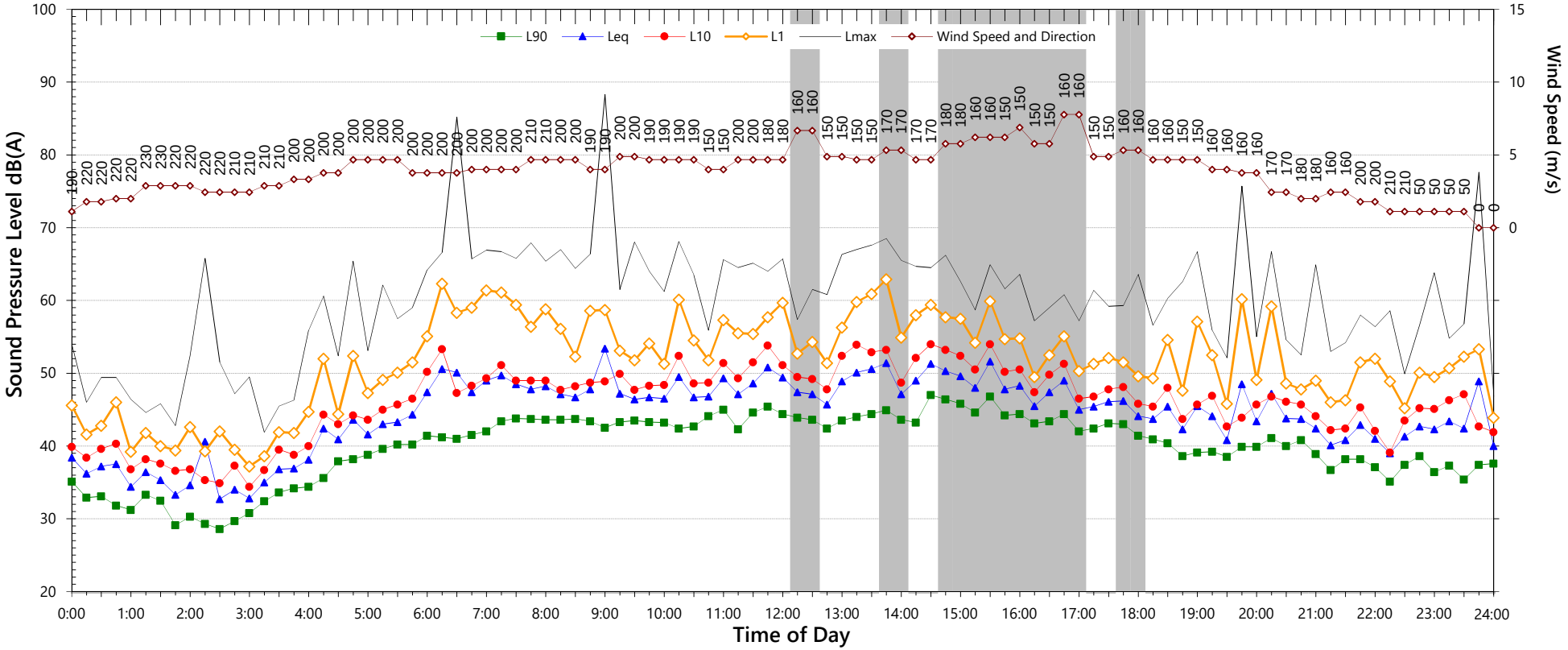
Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Day" is the period from 8am till 6pm on Sundays and 7am til 6pm on other days
3. "Evening" is the period from 6pm till 10pm
4. "Night" relates to the remaining periods
5. "Night" relates to period from 10pm on this graph to morning on the following graph.
6. Graphed data measured in free-field; tabulated results facade corrected
7. Night time L_{Max} values are shown only where L_{Max} >65dB(A) and where L_{Max}- Leq ≥15dB(A)

Unattended Noise Monitoring Results

1416 George Booth Drive

Thursday, 13 October 2016



NSW Industrial Noise Policy (Free Field)			
Descriptor	Day[2]	Evening[3]	Night[4 5]
L_{90}	-	37.1	34.3
LAeq	-	44.1	43.5

Night Time Maximum Noise Levels			(see note 7)
L_{Max} (Range)	68.8	to	77.6
L_{Max} - L_{eq} (Range)	15.3	to	32.6

NSW Road Noise Policy (1m from facade)		(see note 6)
Descriptor	Day	Night[5]
	7am-10pm	10pm-7am
$L_{eq\ 15\ hr}$ and $L_{eq\ 9\ hr}$	50.0	46.0
$L_{eq\ 1hr}$ upper 10 percentile	52.8	50.6
$L_{eq\ 1hr}$ lower 10 percentile	45.0	40.6

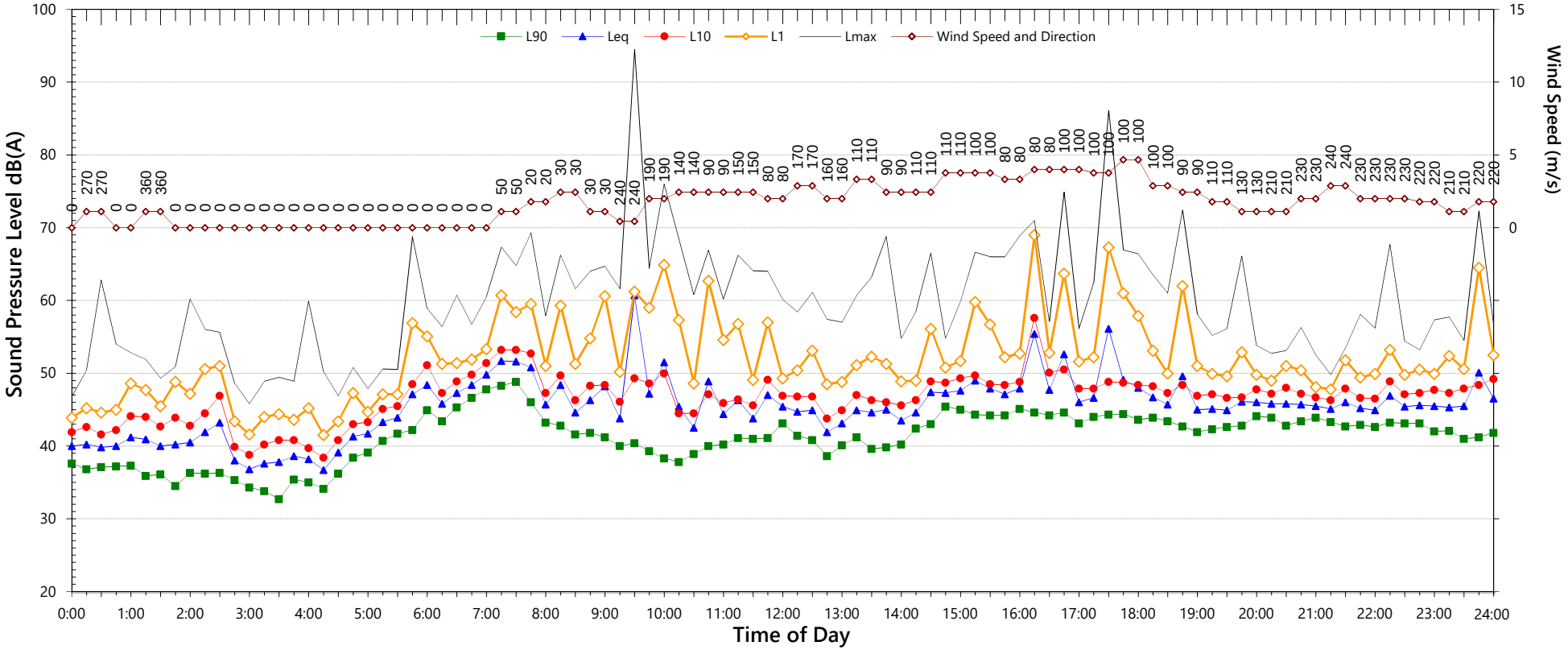
Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Day" is the period from 8am till 6pm on Sundays and 7am til 6pm on other days
3. "Evening" is the period from 6pm till 10pm
4. "Night" relates to the remaining periods
5. "Night" relates to period from 10pm on this graph to morning on the following graph.
6. Graphed data measured in free-field; tabulated results facade corrected
7. Night time L_{Max} values are shown only where L_{Max} >65dB(A) and where L_{Max}- Leq ≥15dB(A)

Unattended Noise Monitoring Results

1416 George Booth Drive

Friday, 14 October 2016



NSW Industrial Noise Policy (Free Field)			
Descriptor	Day[2]	Evening[3]	Night[4 5]
L_{90}	39.3	42.3	37.5
LAeq	49.8	46.0	46.0

Night Time Maximum Noise Levels			(see note 7)
L_{Max} (Range)	67.7	to	72.3
L_{Max} - L_{eq} (Range)	17.2	to	25.0

NSW Road Noise Policy (1m from facade)		(see note 6)
Descriptor	Day	Night[5]
	7am-10pm	10pm-7am
$L_{eq\ 15\ hr}$ and $L_{eq\ 9\ hr}$	51.6	48.5
$L_{eq\ 1hr}$ upper 10 percentile	56.5	53.1
$L_{eq\ 1hr}$ lower 10 percentile	46.7	43.8

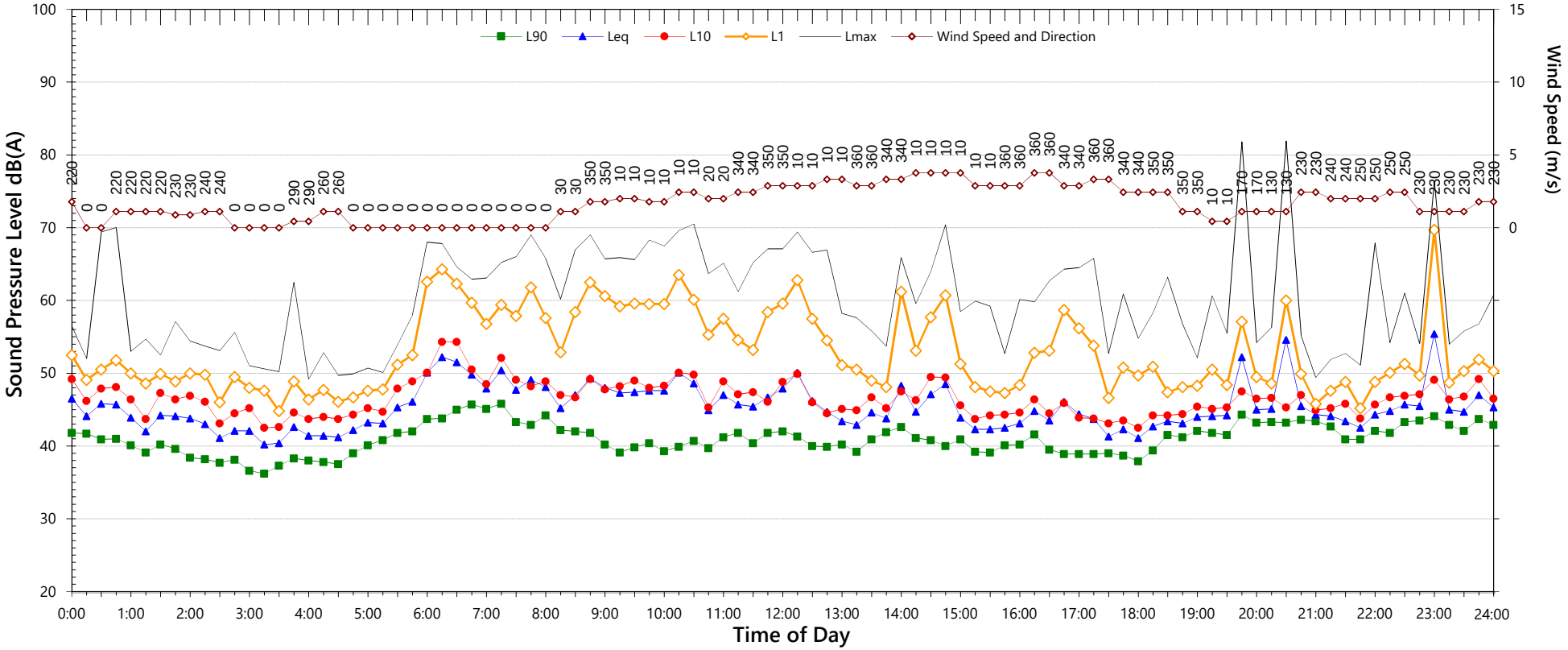
Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Day" is the period from 8am till 6pm on Sundays and 7am til 6pm on other days
3. "Evening" is the period from 6pm till 10pm
4. "Night" relates to the remaining periods
5. "Night" relates to period from 10pm on this graph to morning on the following graph.
6. Graphed data measured in free-field; tabulated results facade corrected
7. Night time L_{Max} values are shown only where L_{Max} >65dB(A) and where L_{Max}- Leq ≥15dB(A)

Unattended Noise Monitoring Results

1416 George Booth Drive

Saturday, 15 October 2016



NSW Industrial Noise Policy (Free Field)			
Descriptor	Day[2]	Evening[3]	Night[4 5]
L_{90}	38.9	40.9	36.6
LAeq	46.5	47.0	47.5

NSW Road Noise Policy (1m from facade)		(see note 6)
Descriptor	Day	Night[5]
	7am-10pm	10pm-7am
$L_{eq\ 15\ hr}$ and $L_{eq\ 9\ hr}$	49.2	49.8
$L_{eq\ 1hr}$ upper 10 percentile	51.9	53.0
$L_{eq\ 1hr}$ lower 10 percentile	44.9	42.6

Night Time Maximum Noise Levels			(see note 7)
L_{Max} (Range)	65.2	to	76.4
L_{Max} - L_{eq} (Range)	15.2	to	25.9

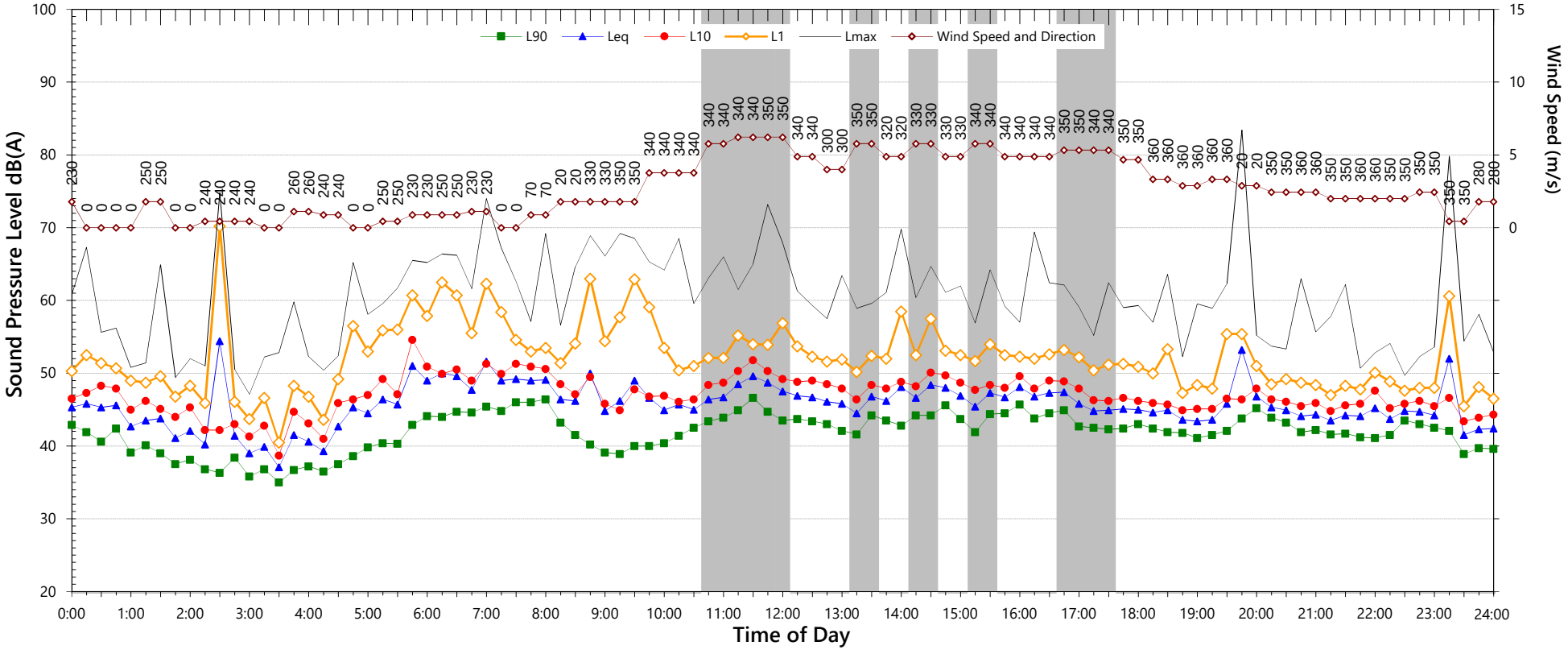
Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Day" is the period from 8am till 6pm on Sundays and 7am til 6pm on other days
3. "Evening" is the period from 6pm till 10pm
4. "Night" relates to the remaining periods
5. "Night" relates to period from 10pm on this graph to morning on the following graph.
6. Graphed data measured in free-field; tabulated results facade corrected
7. Night time L_{Max} values are shown only where L_{Max} >65dB(A) and where L_{Max}- Leq ≥15dB(A)

Unattended Noise Monitoring Results

1416 George Booth Drive

Sunday, 16 October 2016



NSW Industrial Noise Policy (Free Field)			
Descriptor	Day[2]	Evening[3]	Night[4 5]
L_{90}	-	41.1	38.5
LAeq	-	46.1	46.8

Night Time Maximum Noise Levels			(see note 7)
L_{Max} (Range)	66.6	to	84.6
L_{Max} - L_{eq} (Range)	15.4	to	32.7

NSW Road Noise Policy (1m from facade)		(see note 6)
Descriptor	Day	Night[5]
	7am-10pm	10pm-7am
$L_{eq\ 15\ hr}$ and $L_{eq\ 9\ hr}$	49.3	49.3
$L_{eq\ 1hr}$ upper 10 percentile	51.5	54.8
$L_{eq\ 1hr}$ lower 10 percentile	46.7	45.5

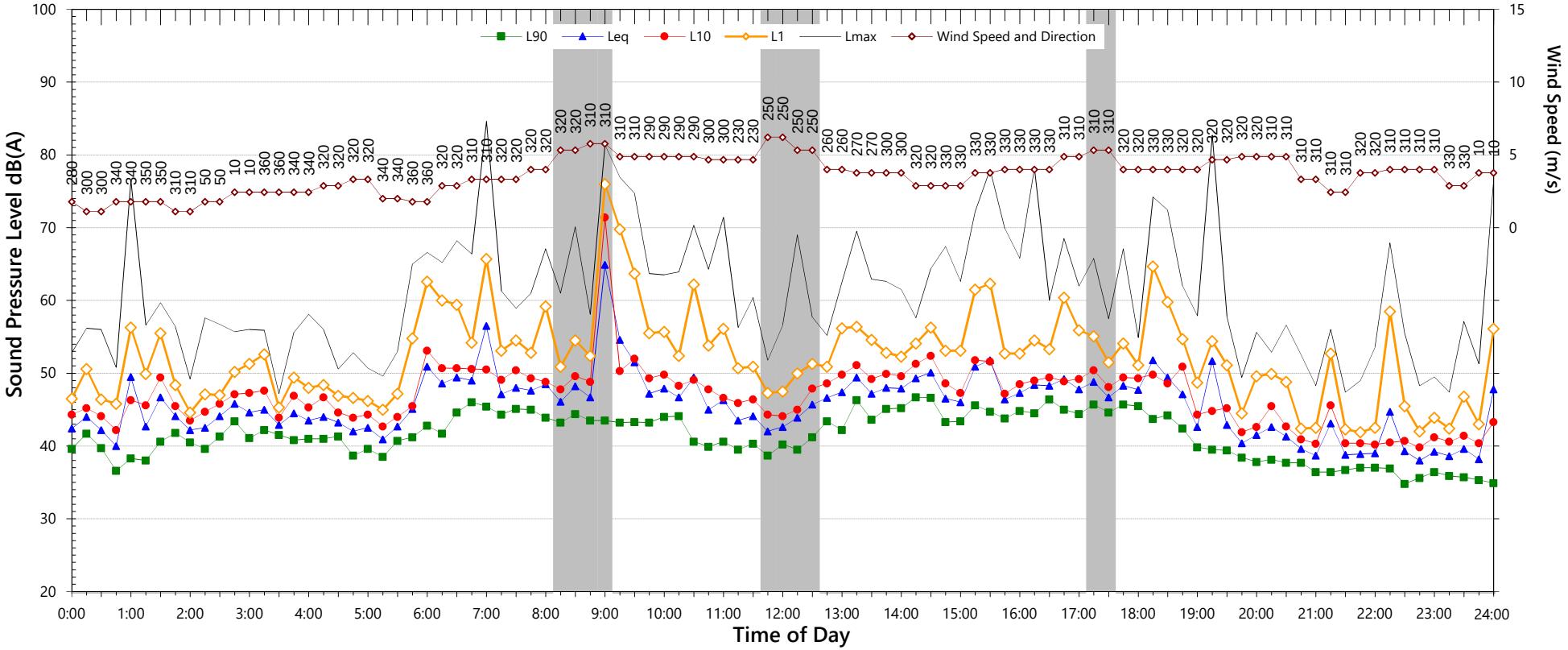
Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Day" is the period from 8am till 6pm on Sundays and 7am til 6pm on other days
3. "Evening" is the period from 6pm till 10pm
4. "Night" relates to the remaining periods
5. "Night" relates to period from 10pm on this graph to morning on the following graph.
6. Graphed data measured in free-field; tabulated results facade corrected
7. Night time L_{Max} values are shown only where L_{Max} >65dB(A) and where L_{Max}- Leq ≥15dB(A)

Unattended Noise Monitoring Results

1416 George Booth Drive

Monday, 17 October 2016



NSW Industrial Noise Policy (Free Field)			
Descriptor	Day[2]	Evening[3]	Night[4 5]
L_{90}	-	36.4	34.8
LAeq	-	45.7	47.0

NSW Road Noise Policy (1m from facade)	(see note 6)	
Descriptor	Day	Night[5]
	7am-10pm	10pm-7am
$L_{eq\ 15\ hr}$ and $L_{eq\ 9\ hr}$	50.4	49.5
$L_{eq\ 1hr}$ upper 10 percentile	53.2	56.4
$L_{eq\ 1hr}$ lower 10 percentile	43.1	41.4

Night Time Maximum Noise Levels			(see note 7)
L_{Max} (Range)	65.6	to	86.3
L_{Max} - L_{eq} (Range)	16.0	to	33.6

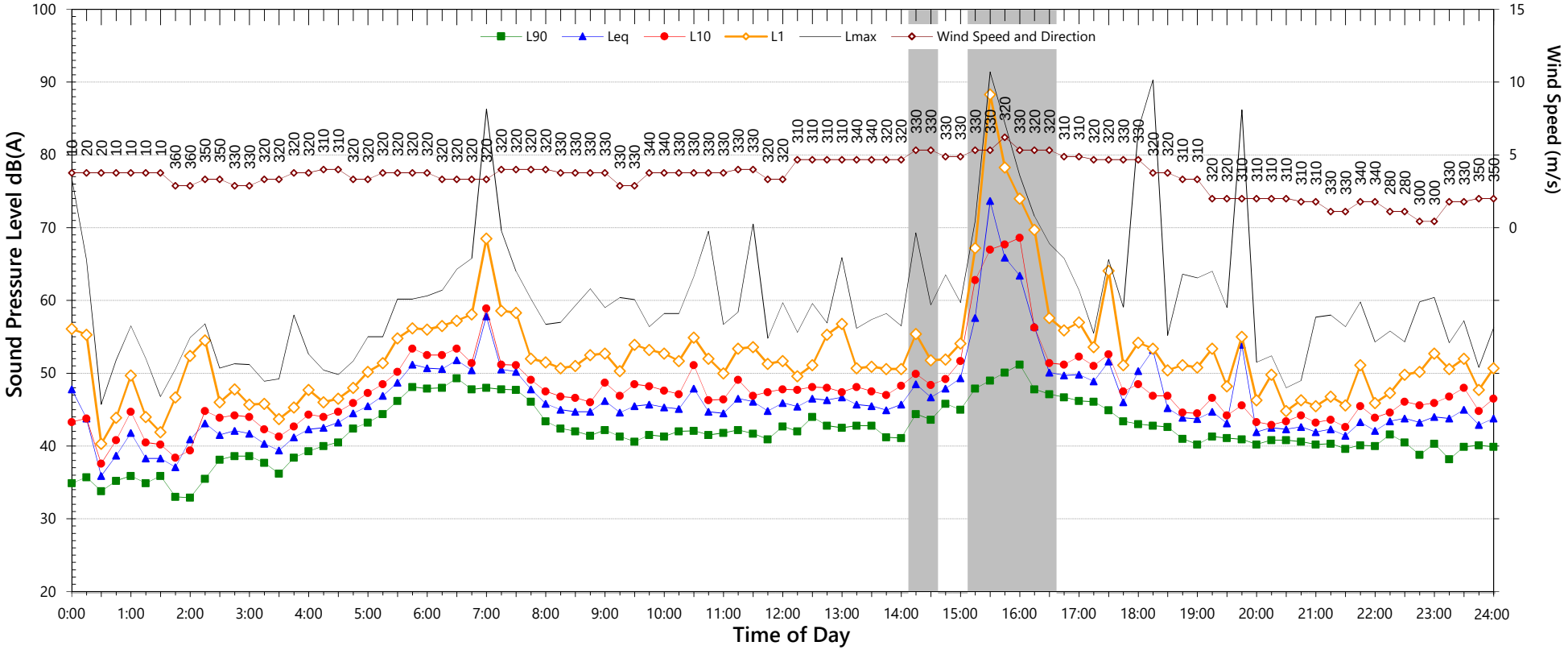
Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Day" is the period from 8am till 6pm on Sundays and 7am til 6pm on other days
3. "Evening" is the period from 6pm till 10pm
4. "Night" relates to the remaining periods
5. "Night" relates to period from 10pm on this graph to morning on the following graph.
6. Graphed data measured in free-field; tabulated results facade corrected
7. Night time L_{Max} values are shown only where L_{Max} >65dB(A) and where L_{Max}- Leq ≥15dB(A)

Unattended Noise Monitoring Results

1416 George Booth Drive

Tuesday, 18 October 2016



NSW Industrial Noise Policy (Free Field)			
Descriptor	Day[2]	Evening[3]	Night[4 5]
L_{90}	41.2	40.0	36.1
LAeq	47.2	46.6	47.9

Night Time Maximum Noise Levels			(see note 7)
L_{Max} (Range)	65.2	to	75.9
L_{Max} - L_{eq} (Range)	16.8	to	27.1

NSW Road Noise Policy (1m from facade)		(see note 6)
Descriptor	Day	Night[5]
	7am-10pm	10pm-7am
$L_{eq\ 15\ hr}$ and $L_{eq\ 9\ hr}$	49.6	50.4
$L_{eq\ 1hr}$ upper 10 percentile	52.2	55.9
$L_{eq\ 1hr}$ lower 10 percentile	44.8	45.0

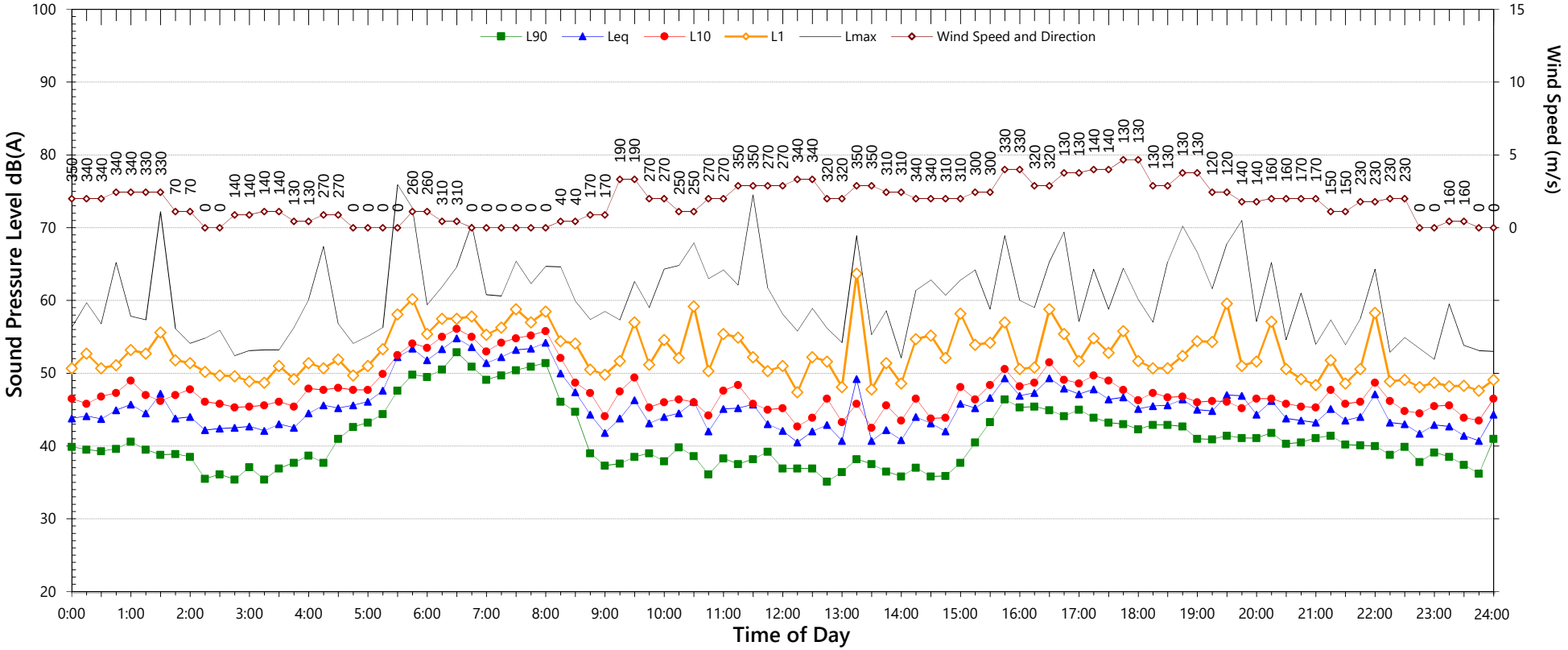
Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Day" is the period from 8am till 6pm on Sundays and 7am til 6pm on other days
3. "Evening" is the period from 6pm till 10pm
4. "Night" relates to the remaining periods
5. "Night" relates to period from 10pm on this graph to morning on the following graph.
6. Graphed data measured in free-field; tabulated results facade corrected
7. Night time L_{Max} values are shown only where L_{Max} >65dB(A) and where L_{Max}- Leq ≥15dB(A)

Unattended Noise Monitoring Results

1416 George Booth Drive

Wednesday, 19 October 2016



NSW Industrial Noise Policy (Free Field)			
Descriptor	Day[2]	Evening[3]	Night[4 5]
L_{90}	36.1	40.1	34.9
LAeq	47.2	45.3	45.8

NSW Road Noise Policy (1m from facade)		(see note 6)
Descriptor	Day	Night[5]
	7am-10pm	10pm-7am
$L_{eq\ 15\ hr}$ and $L_{eq\ 9\ hr}$	49.3	48.3
$L_{eq\ 1hr}$ upper 10 percentile	53.9	52.8
$L_{eq\ 1hr}$ lower 10 percentile	45.4	43.7

Night Time Maximum Noise Levels			(see note 7)
L_{Max} (Range)	69.2	to	76.8
L_{Max} - L_{eq} (Range)	17.0	to	30.2

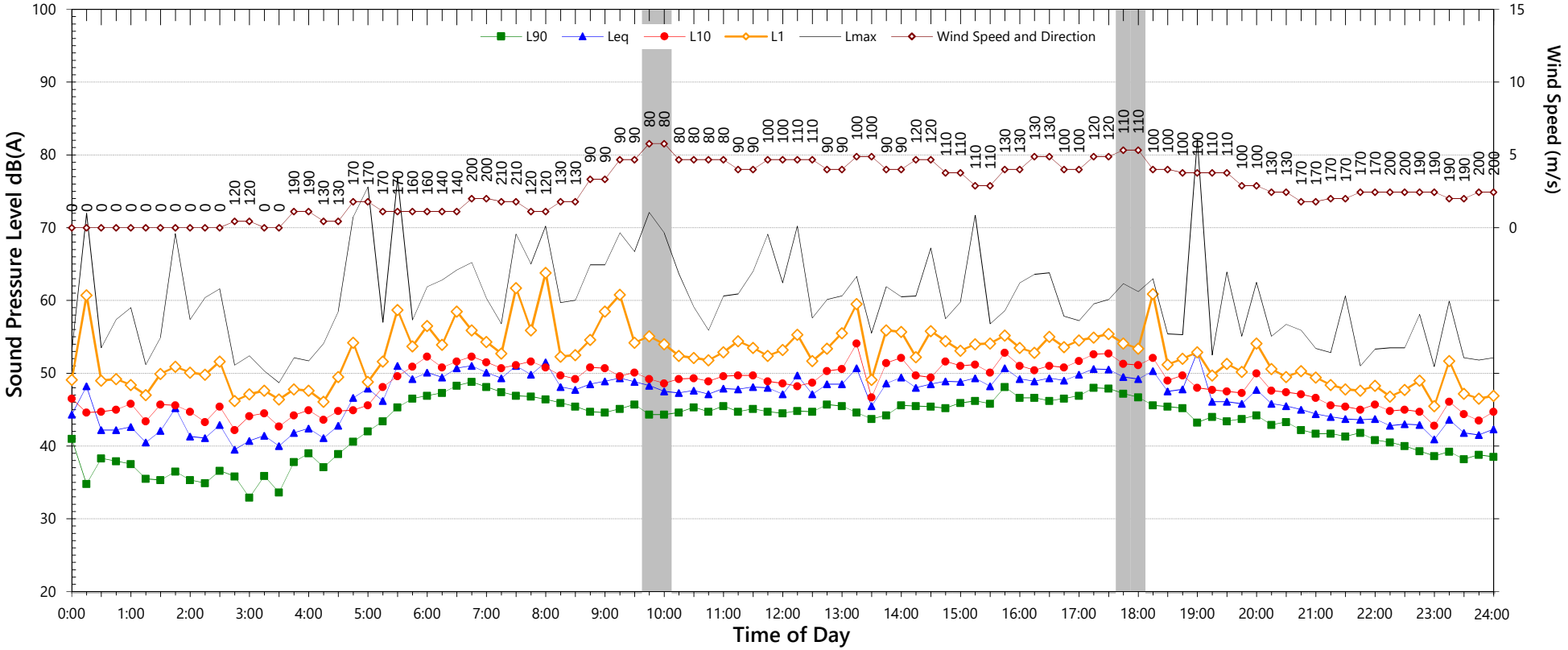
Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Day" is the period from 8am till 6pm on Sundays and 7am til 6pm on other days
3. "Evening" is the period from 6pm till 10pm
4. "Night" relates to the remaining periods
5. "Night" relates to period from 10pm on this graph to morning on the following graph.
6. Graphed data measured in free-field; tabulated results facade corrected
7. Night time L_{Max} values are shown only where L_{Max} >65dB(A) and where L_{Max}- Leq ≥15dB(A)

Unattended Noise Monitoring Results

1416 George Booth Drive

Thursday, 20 October 2016



NSW Industrial Noise Policy (Free Field)			
Descriptor	Day[2]	Evening[3]	Night[4 5]
L_{90}	44.6	41.3	37.3
LAeq	49.0	47.1	46.5

NSW Road Noise Policy (1m from facade)		(see note 6)
Descriptor	Day	Night[5]
	7am-10pm	10pm-7am
$L_{eq\ 15\ hr}$ and $L_{eq\ 9\ hr}$	51.0	49.0
$L_{eq\ 1hr}$ upper 10 percentile	53.0	54.1
$L_{eq\ 1hr}$ lower 10 percentile	47.0	44.3

Night Time Maximum Noise Levels			(see note 7)
L_{Max} (Range)	70.1	to	79.9
L_{Max} - L_{eq} (Range)	15.6	to	33.4

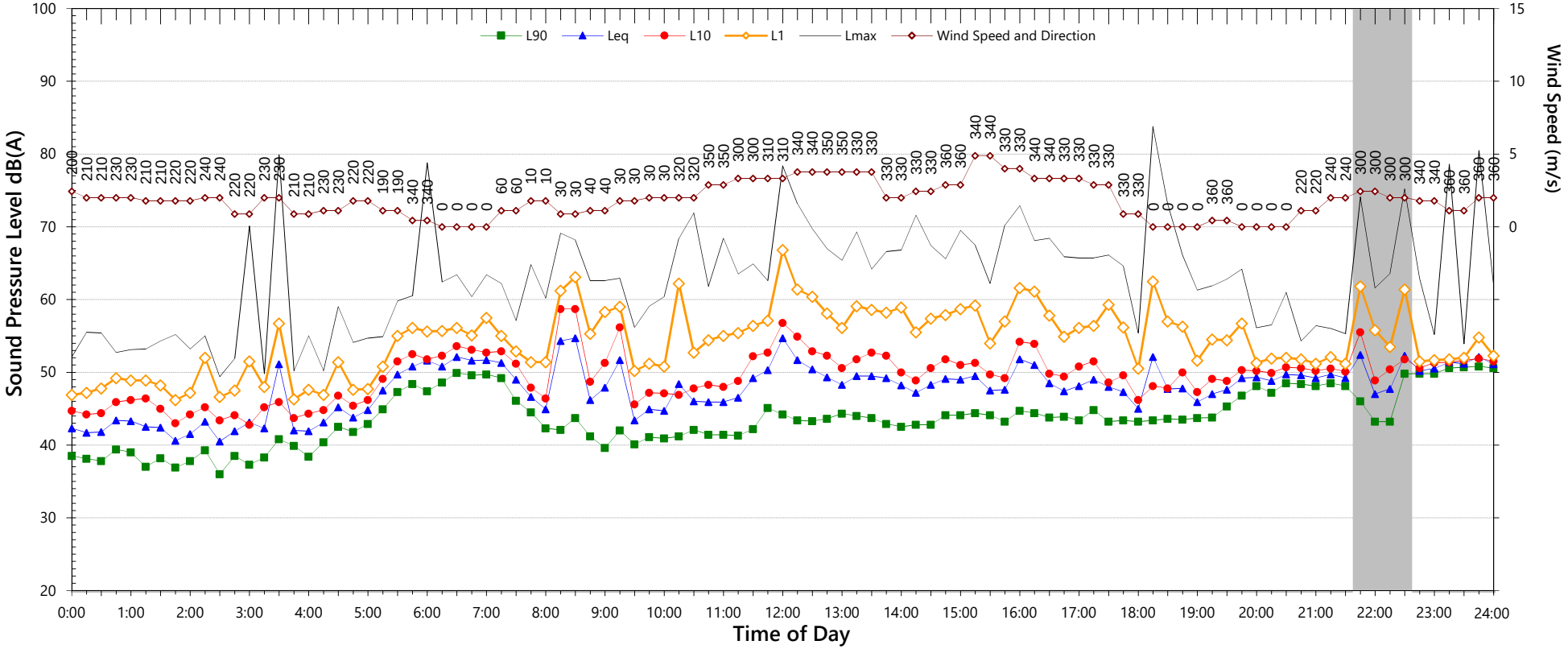
Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Day" is the period from 8am till 6pm on Sundays and 7am til 6pm on other days
3. "Evening" is the period from 6pm till 10pm
4. "Night" relates to the remaining periods
5. "Night" relates to period from 10pm on this graph to morning on the following graph.
6. Graphed data measured in free-field; tabulated results facade corrected
7. Night time L_{Max} values are shown only where L_{Max} >65dB(A) and where L_{Max}- Leq ≥15dB(A)

Unattended Noise Monitoring Results

1416 George Booth Drive

Friday, 21 October 2016



NSW Industrial Noise Policy (Free Field)			
Descriptor	Day[2]	Evening[3]	Night[4 5]
L_{90}	41.2	43.5	39.4
LAeq	49.4	49.0	47.8

NSW Road Noise Policy (1m from facade)	(see note 6)	
Descriptor	Day	Night[5]
	7am-10pm	10pm-7am
$L_{eq\ 15\ hr}$ and $L_{eq\ 9\ hr}$	51.8	50.3
$L_{eq\ 1hr}$ upper 10 percentile	54.3	54.0
$L_{eq\ 1hr}$ lower 10 percentile	49.6	43.5

Night Time Maximum Noise Levels			(see note 7)
L_{Max} (Range)	69.1	to	80.5
L_{Max} - L_{eq} (Range)	16.9	to	29.0

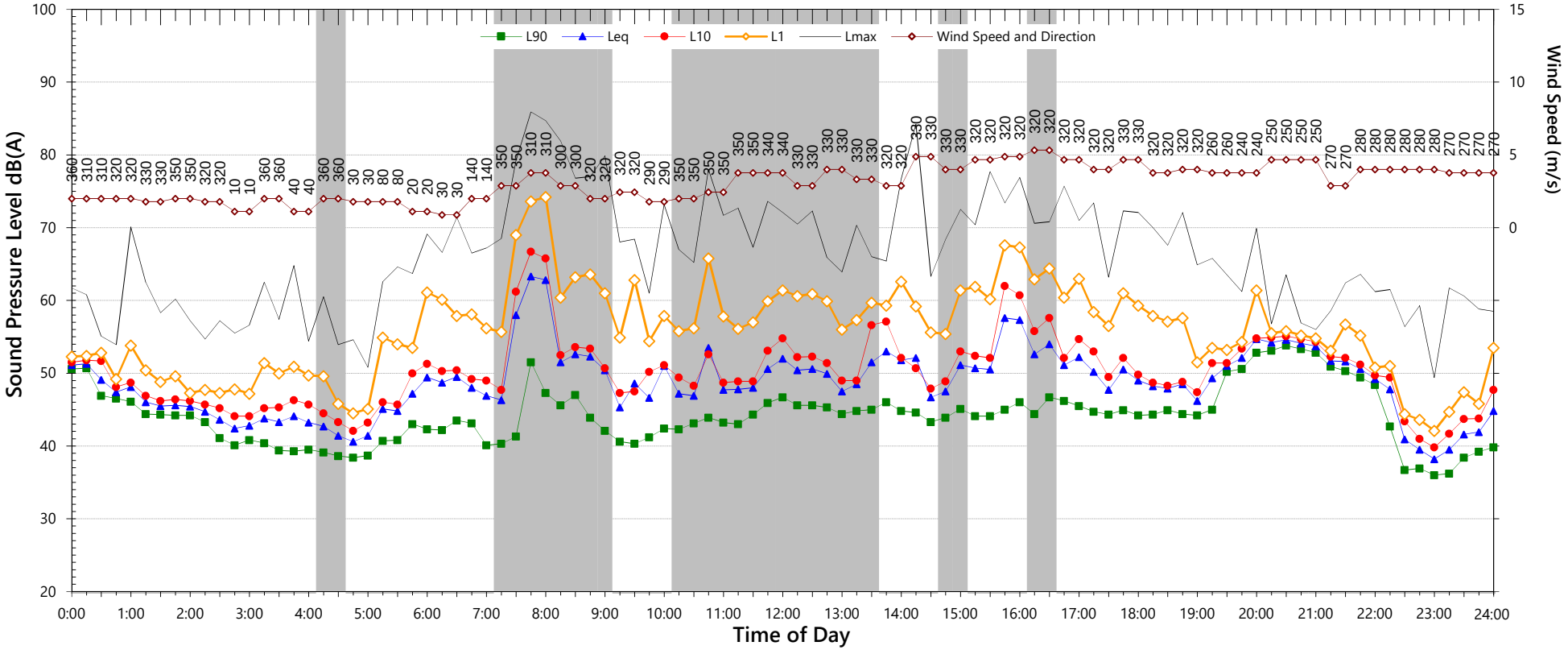
Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Day" is the period from 8am till 6pm on Sundays and 7am til 6pm on other days
3. "Evening" is the period from 6pm till 10pm
4. "Night" relates to the remaining periods
5. "Night" relates to period from 10pm on this graph to morning on the following graph.
6. Graphed data measured in free-field; tabulated results facade corrected
7. Night time L_{Max} values are shown only where L_{Max} >65dB(A) and where L_{Max}- Leq ≥15dB(A)

Unattended Noise Monitoring Results

1416 George Booth Drive

Saturday, 22 October 2016



NSW Industrial Noise Policy (Free Field)			
Descriptor	Day[2]	Evening[3]	Night[4 5]
L_{90}	-	44.3	36.8
LAeq	-	51.8	47.6

NSW Road Noise Policy (1m from facade)	(see note 6)	
Descriptor	Day	Night[5]
	7am-10pm	10pm-7am
$L_{eq\ 15\ hr}$ and $L_{eq\ 9\ hr}$	54.4	50.1
$L_{eq\ 1hr}$ upper 10 percentile	57.8	56.5
$L_{eq\ 1hr}$ lower 10 percentile	50.3	43.2

Night Time Maximum Noise Levels			(see note 7)
L_{Max} (Range)	66.4	to	82.7
L_{Max} - L_{eq} (Range)	18.1	to	30.6

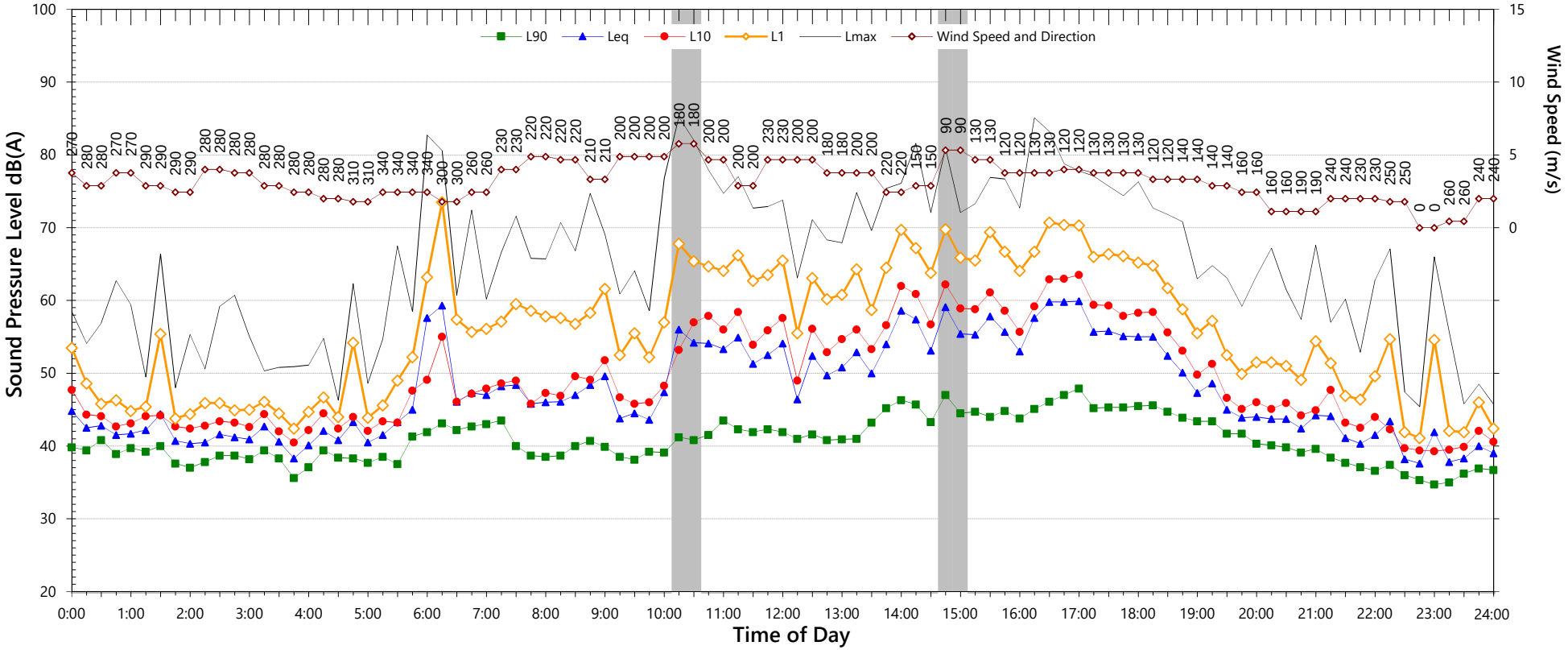
Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Day" is the period from 8am till 6pm on Sundays and 7am til 6pm on other days
3. "Evening" is the period from 6pm till 10pm
4. "Night" relates to the remaining periods
5. "Night" relates to period from 10pm on this graph to morning on the following graph.
6. Graphed data measured in free-field; tabulated results facade corrected
7. Night time L_{Max} values are shown only where L_{Max} >65dB(A) and where L_{Max}- Leq ≥15dB(A)

Unattended Noise Monitoring Results

1416 George Booth Drive

Sunday, 23 October 2016



NSW Industrial Noise Policy (Free Field)			
Descriptor	Day[2]	Evening[3]	Night[4 5]
L_{90}	39.1	37.1	35.8
LAeq	54.7	47.8	44.7

NSW Road Noise Policy (1m from facade)		(see note 6)
Descriptor	Day	Night[5]
	7am-10pm	10pm-7am
$L_{eq\ 15\ hr}$ and $L_{eq\ 9\ hr}$	55.7	47.2
$L_{eq\ 1hr}$ upper 10 percentile	60.4	53.4
$L_{eq\ 1hr}$ lower 10 percentile	45.3	41.4

Night Time Maximum Noise Levels			(see note 7)
L_{Max} (Range)	67.1	to	74.2
L_{Max} - L_{eq} (Range)	16.8	to	26.2

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
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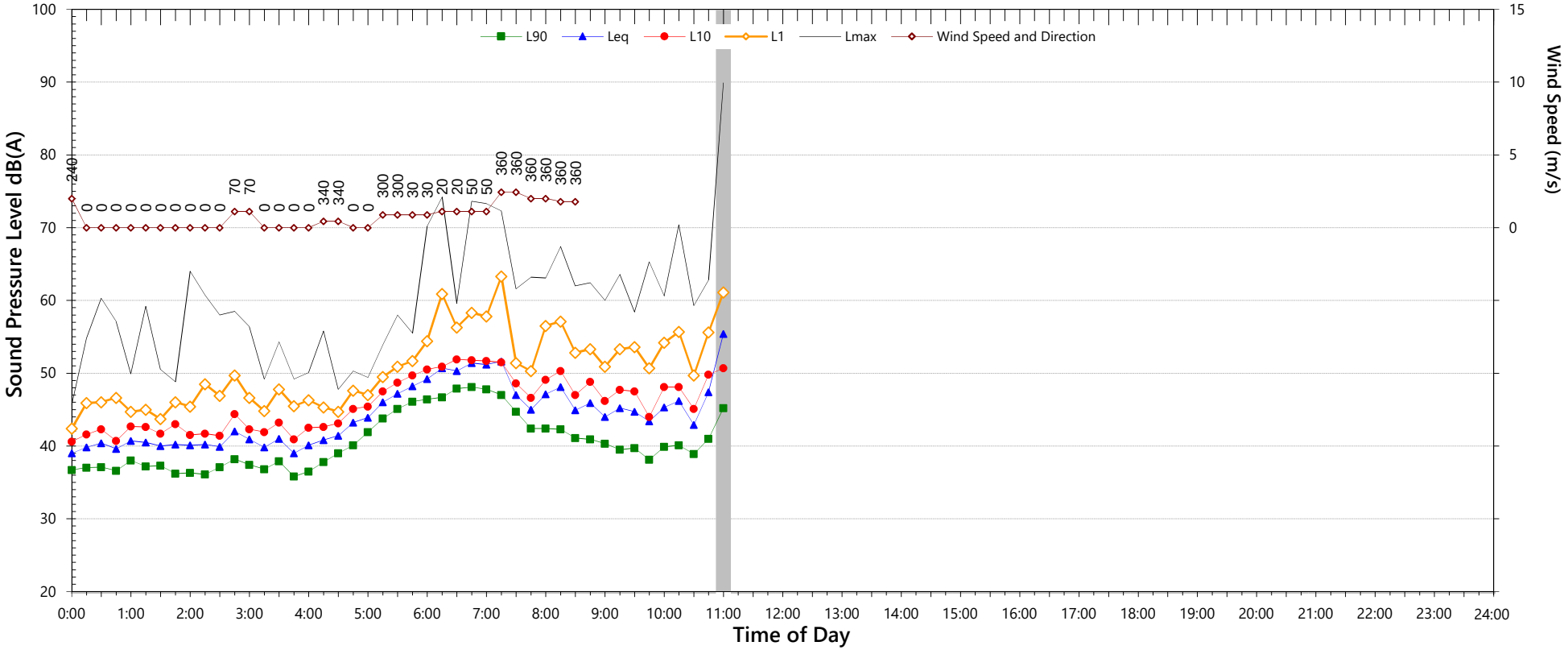
3. "Evening" is the period from 6pm till 10pm
4. "Night" relates to the remaining periods
5. "Night" relates to period from 10pm on this graph to morning on the following graph.
6. Graphed data measured in free-field; tabulated results facade corrected
7. Night time L_{Max} values are shown only where L_{Max} >65dB(A) and where L_{Max}- Leq ≥15dB(A)

Unattended Noise Monitoring Results

1416 George Booth Drive

Monday, 24 October 2016



NSW Industrial Noise Policy (Free Field)			
Descriptor	Day[2]	Evening[3]	Night[4 5]
L_{90}	-	-	-
LAeq	-	-	-

Night Time Maximum Noise Levels			(see note 7)
L_{Max} (Range)	-	to	-
L_{Max} - L_{eq} (Range)	-	to	-

NSW Road Noise Policy (1m from facade)		(see note 6)
Descriptor	Day	Night[5]
	7am-10pm	10pm-7am
$L_{eq\ 15\ hr}$ and $L_{eq\ 9\ hr}$	49.0	-
$L_{eq\ 1hr}$ upper 10 percentile	50.9	-
$L_{eq\ 1hr}$ lower 10 percentile	47.2	-

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Day" is the period from 8am till 6pm on Sundays and 7am til 6pm on other days
3. "Evening" is the period from 6pm till 10pm
4. "Night" relates to the remaining periods
5. "Night" relates to period from 10pm on this graph to morning on the following graph.
6. Graphed data measured in free-field; tabulated results facade corrected
7. Night time L_{Max} values are shown only where L_{Max} >65dB(A) and where L_{Max}- Leq ≥15dB(A)

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