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NSW GOVERNMENT

M1 Pacific Motorway extension to Raymond Terrace

Environmental impact statement – Chapter 22: Safety and risk

Transport for NSW | July 2021

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22. Safety and risk

This chapter presents an assessment of project safety and risks during construction and operation, and identifies management measures to minimise and reduce these risks. The safety and risk assessment for this project will inform the detailed design, construction and operation of the project to avoid, to the greatest extent possible, risk to public safety and the environment.

The desired performance outcomes for the project relating to safety and risk, as outlined in the SEARs, are to:

- Avoid, to the greatest extent possible, risk to public safety.

Table 22-1 outlines the SEARs that relate to safety and risk and identifies where they are addressed in this EIS.

Table 22-1 SEARs (safety and risk)

Secretary's requirement	Where addressed
17. Safety and risk	
1. The Proponent must assess the likely risks of the project to public safety, paying particular attention to pedestrian safety, subsidence risks, bushfire risks and the storage, handling and use of dangerous goods and contaminated material.	The likely risks of the project are identified and assessed in **Section 22.4**.
2. The Proponent must assess the biosecurity risk of the project to minimise the inadvertent spread of disease and pathogens affecting agricultural activities, native vegetation and threatened fauna.	The biosecurity risk of the project is assessed in **Section 22.4**. Further information on potential for spread of pests, disease or weeds, and the 'general biosecurity duty' is provided in **Chapter 9** (biodiversity).

22.1 Policy and planning setting

The safety and risk assessment has been prepared in accordance with local, state and national and legislation, policy and guidance that is endorsed or accepted by Australian health and environmental authorities. This includes, but is not limited to:

- Legislation:
  - *Work Health and Safety Act 2011*
  - *Rural Fires Act 1997*
  - *Dangerous Goods (Road and Rail Transport) Act 2008*
  - Dangerous Goods (Road and Rail Transport) Regulation 2014
- Plans and policies:
  - Australian Dangerous Goods Code (National Transport Commission 2020).
  - Newcastle Bush Fire Management Committee Bush Fire Risk Management Plan (BFRMP) (Newcastle Bush Fire Management Committee 2018)
  - State Environmental Planning Policy No. 33 (SEPP 33) – Hazardous and Offensive Development (NSW)

- Guidelines:
  - Environmental Health Risk Assessment: Guidelines for Assessing Human Health Risks from Environmental Hazards: 2012 (enHealth 2012a)
  - Applying State Environmental Planning Policy 33 (SEPP 33): Hazardous and Offensive Development Application Guidelines (DPE 2011)
  - Health Impact Assessment Guidelines (enHealth 2017)
  - Health Impact Assessment: A Practical Guide (NSW Health 2007)
  - Planning for Bush Fire Protection (NSW Rural Fire Service 2006).

22.2 Assessment methodology

The project has the potential to impact the safety of the public, construction workforce, road users and communities surrounding the project. An assessment was carried out in accordance with the policies and guidance presented in **Section 22.1** and using the methodology described in this section.

22.2.1 Public safety risks

Public safety risks include risks present in the construction workplace and environmental hazards that may present risks to road users and surrounding communities. An assessment of public safety in the context of exposure to environmental hazards was conducted in accordance with the methodology for assessing health impacts as defined by NSW Health (2007) and included:

- A review of the potential noise and vibration and air quality impacts that may arise from construction and operation of the project as described in **Chapter 8** (noise and vibration) and **Chapter 18** (air quality)
- Identification of hazards which may lead to or contribute to human health and public safety risks, through desktop analysis, based on typical hazards encountered during construction and operation of a motorway.

22.2.2 Road, pedestrian and cyclist safety

The assessment of road, pedestrian and cyclist safety included a review of the traffic and transport safety hazards that may arise from the construction and operation of the project as described in **Chapter 7** (traffic and transport) to identify potential risks associated with the identified traffic and transport safety hazards.

22.2.3 Bushfire risk

The assessment of bushfire risk for the project was conducted in accordance with Planning for Bush Fire Protection (NSW Rural Fire Service 2006) and involved a desktop review of spatial datasets and available literature, including:

- NSW Bushfire Prone Land Map Tool (NSW Rural Fire Service 2016)
  - City of Newcastle Bush Fire Prone Land Map (City of Newcastle 2018b)
  - Port Stephens Council Bush Fire Prone Land Map (Port Stephens Council 2009)
  - Maitland City Council online mapping (Maitland City Council 2018).
- Climate data in the vicinity of the project (Australian Bureau of Meteorology 2020b)
- Newcastle Bushfire Risk Management Plan 2018-2023 (Newcastle Bush Fire Management Committee 2018).

The NSW Bushfire Prone Land Map Tool (NSW Rural Fire Service 2016) (accessed December 2020) was reviewed to identify where the construction footprint intersects bushfire prone land. Existing land uses, based on spatial data and aerial photography, were also assessed to determine the potential bushfire risk on properties.

22.2.4 Flood evacuation risks

The assessment of flood evacuation risks included a review of the impacts to flood evacuation routes that may arise from the construction and operation of the project as described in **Chapter 10** (hydrology and flooding) to identify risks associated with identified flood evacuation routes.

22.2.5 Storage, handling and use of dangerous goods and hazardous material

The Australian Dangerous Goods Code (National Transport Commission 2020) lists all dangerous goods and notes their classification. Each of the dangerous goods are assigned a specific United Nations number and are divided into classes, based on their predominant hazard. The assessment of dangerous goods and hazardous material risk for the project included:

- A desktop review to identify potentially dangerous and hazardous material required during construction and operation of the project
- Identification of the risks to road users and the public arising from the storage, handling and use and transportation of dangerous goods and hazardous materials to and within the construction footprint.

It is noted that while SEPP 33 is not applicable to the project, given that the project is classified as State Significant Infrastructure (refer to **Chapter 2**), the principles of SEPP 33 and Applying State Environmental Planning Policy 33 (SEPP 33): Hazardous and Offensive Development Application Guidelines (Department of Planning and Environment 2011) have been considered to identify potential hazards associated with the project.

22.2.6 Contamination hazards

The assessment of risks from contamination hazards included a review of the contamination hazards that may arise from the construction and operation of the project as described in **Chapter 16** (soils and contamination).

22.2.7 Subsidence risk

The assessment of subsidence risk included:

- A search of the NSW Planning Portal (administered by the NSW Government) to identify mine subsidence districts in the vicinity of the project
- A review of data from the NSW Department of Planning, Industry and Environment (DPIE) MinView database for mining, extractive industries and exploration activities
- A comparison of the identified subsidence districts with the construction and operational footprints of the project to identify whether construction or operational activities would occur within a subsidence district, resulting in subsidence risks.

22.2.8 Biosecurity risk

The assessment of biosecurity risk included:

- A review of the impacts of the spread of disease and pathogens to native vegetation and threatened fauna identified within **Chapter 9** (biodiversity)
- A review of the Australian Interstate Quarantine map (administered by Plant Health Australia) on 17 December 2020 to identify any biosecurity zones in the vicinity of the project
- A review of the existing agricultural activities within the construction footprint identified within **Chapter 14** (land use and property) to identify agricultural activities that may be impacted by spread of disease and pathogens.

22.3 Existing environment

22.3.1 Public safety risks

The existing public safety risks of the construction footprint and surrounding areas are those typically associated with the operation of the existing road network. Existing public safety hazards include:

- Hazards to the maintenance workforce as a result of road maintenance activities
- Health risks to road users and nearby communities, including:
  - Existing road noise impacts as described in **Section 8.3.2**
  - Air quality impacts as described in **Section 18.3.3**
  - Noise impacts associated with any existing construction activities.

22.3.2 Road, pedestrian and cyclist safety

Existing road safety performance is detailed in **Section 3.2.6** and **Section 7.3.4**.

A summary of the crash history for the five-year period between October 2014 to September 2019 on key roads within the traffic and transport study area (identified in **Figure 7-2**) is provided in **Table 3-3**. In summary, a total of 289 crashes were recorded, of which six crashes were fatal. The New England Highway and Pacific Highway recorded the highest number of crashes, commensurate with the high traffic volumes on these roads. Old Punt Road and Tomago Road recorded the lowest number of crashes over the five-year period.

Of all the crashes recorded, two involved pedestrians, both being fatalities. Of these two crashes one was located outside of the construction footprint on Weakleys Drive with the other located within the construction footprint on the Pacific Highway south of Old Punt Road. Three crashes recorded involved cyclists. Of these crashes, none involved fatalities and all were located within the construction footprint.

As described in **Section 5.3.16** existing pedestrian infrastructure is limited along the existing M1 Pacific Motorway due to the relatively low demand. Footpaths are located on some local roads within the vicinity of the project. Signalised pedestrian crossings are located at existing intersections along the Pacific Highway and Tomago Road.

As there are no existing cycle paths located within the vicinity of the project, cyclists use the shoulders of the existing road network. Dedicated off road cycleways are currently proposed by the City of Newcastle as described in **Section 5.3.16**.

22.3.3 Bushfire risks

Bushfire season for the lower Hunter region is typically from October to March, with most fires a result of illegal burning off, lightning strikes and car dumping (Newcastle Bush Fire Management Committee 2018).

Based on a review of the City of Newcastle Council Bush Fire Prone Land Map (City of Newcastle 2018b) and Port Stephens Council Bush Fire Prone Land Map (Port Stephens Council 2009) and Maitland City Council's online mapping tool (Maitland City Council 2018), the project would be located within and near bushfire prone land. As shown on **Figure 22-1** the project includes vegetation classified as:

- Vegetation Category 1, considered to be the highest risk for bushfire. Within the vicinity of the project, Category 1 vegetation is mostly located in Black Hill and through Tomago, Heatherbrae and Raymond Terrace
- Vegetation Category 2, considered to be a lower bush fire risk than Category 1 and 3. Within the vicinity of the project, Category 2 vegetation is mostly located to the west and north of the Hunter River
- Vegetation Category 3, considered to be a medium bush fire risk. Within the vicinity of the project, Category 3 vegetation is located mostly along the floodplain west of the Hunter River
- Buffer zones, which are also considered to be bushfire prone land.

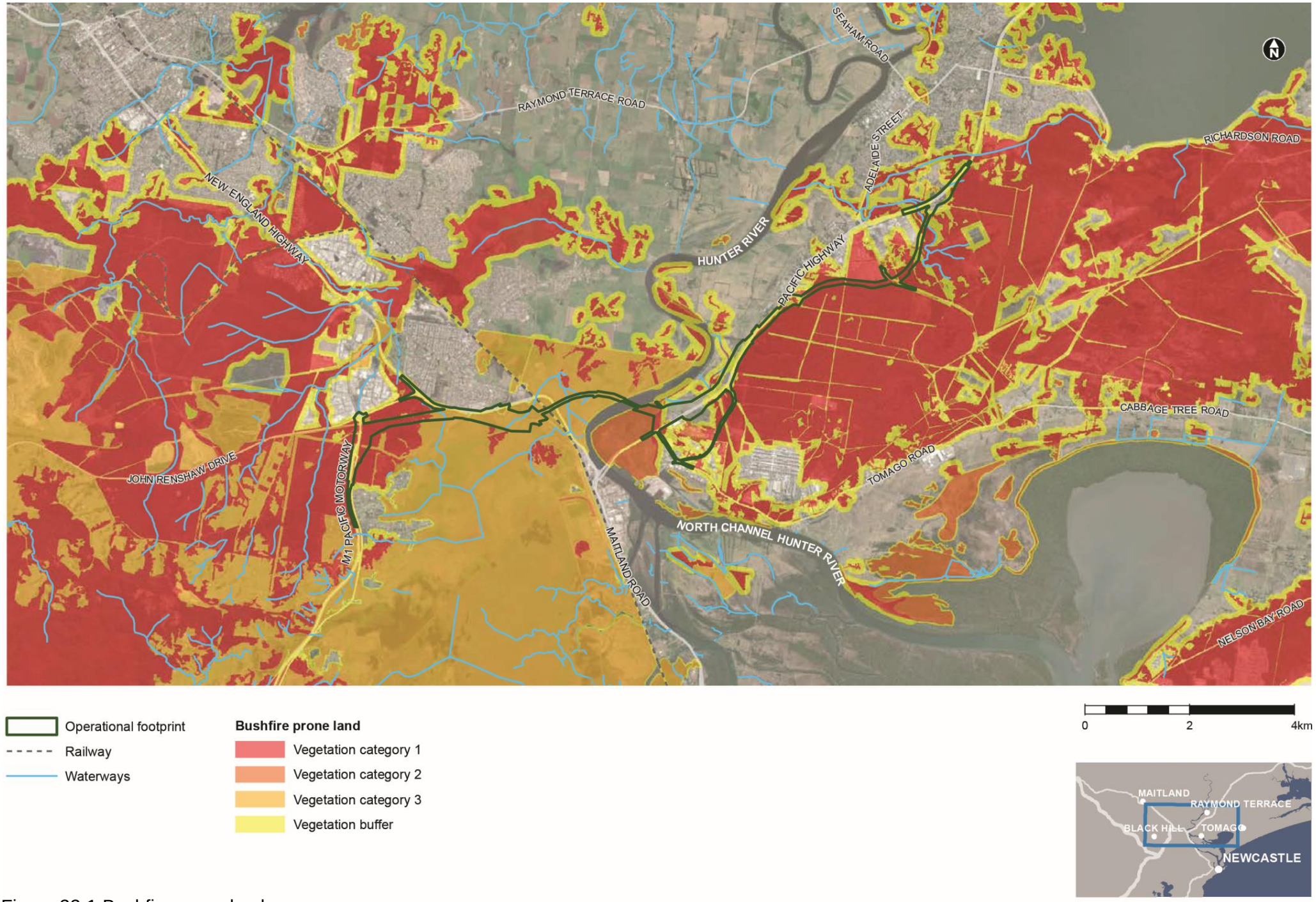

Figure 22-1 Bushfire prone land

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22.3.4 Flood evacuation risks

The existing major roads near the project that form the main evacuation and emergency access routes from areas that are flood prone are listed in **Table 22-2**. The conditions in which these roads would flood are also listed in **Table 22-2**. Existing flooding conditions and the main emergency and access routes that are flood prone are further discussed in **Section 10.3.5**.

Table 22-2 Flooding on existing major roads

Road	Comment
West of Hunter River	
M1 Pacific Motorway and John Renshaw Drive – Black Hill to Tarro	• Flood free except for in the PMF at Lenaghan, at crossing of an unnamed creek which drains to the north-western end of Hexham Swamp
New England Highway – Thornton to Beresfield	• Flood free up to and including 1% AEP flood event • Flooded during the PMF at Viney Creek
New England Highway – Tarro	• Flooded in 2% AEP flood event, immediately west of Anderson Drive overpass
Pacific Highway – Hexham	• Existing twin bridges crossing the Hunter River (Hexham Bridge) are flood free in all events except for the PMF
New England Highway, Pacific Highway, Maitland Road – Hexham	• New England Highway heading north into Tarro flooded to 0.3m depth in 10% AEP flood event • Pacific Highway flooded in 10% AEP flood event affecting access to the south toward Hexham and Sandgate • Unlikely to be trafficable in 5% AEP flood event
East of Hunter River	
Pacific Highway – Tomago	• Flooded to 0.1m depth in 20% AEP flood event, between Hexham Bridge and Tomago Road. Tomago Road also flooded at intersection. Unlikely to be trafficable in 10% AEP flood event due to depths over 0.4m • Minor flooding in 10% AEP flood event, just south of Hunter Region Botanic Gardens
Old Punt Road – alternative access from Tomago to Heatherbrae	• Flooded in 20% AEP flood event
Tomago Road and Masonite Road – alternative access from Tomago to Heatherbrae	• Flooded to 1m depths in 20% AEP flood event, access cut-off
Pacific Highway – Heatherbrae and Raymond Terrace	• Remains flood free up to the 5% AEP flood event • The Pacific Highway experiences depths of flooding over 0.5m during the 2% AEP flood event near Windeyers Creek, access cut-off over 1km length • Access cut-off at Grahamstown Drain in the PMF
Adelaide Street – Alternative access to north of Raymond Terrace	• Access cut-off in 2% AEP flood event at Windeyers Creek and 450m section to the north.

22.3.5 Storage, handling and use of dangerous goods and hazardous material

Dangerous goods and hazardous materials are currently stored within the vicinity of the project for use in construction activities of other projects, farming practices or industrial uses. Road users are required to transport dangerous goods and hazardous materials within the surrounding road network in accordance with the *Dangerous Goods (Road and Rail Transport) Act 2008* and the Dangerous Goods (Road and Rail Transport) Regulation 2014.

Businesses within the vicinity of the project include automotive, construction and industrial manufacturing businesses, which may store or transport higher quantities of dangerous goods such as diesel fuels and oils, greases and lubricants, paints and epoxies, cement and concrete, hydrated lime and curing compounds. Businesses are required to store, handle and use these dangerous goods and hazardous substances in accordance with the *NSW Work Health and Safety Act 2011* and relevant Australian Standards. Further information on businesses surrounding the project is provided in **Chapter 13** (socio-economic).

22.3.6 Contamination hazards

- Within and adjacent to the construction footprint there are several areas of potential contamination risk (AOPCR) that were identified as medium to high risk including: High risk AOPCRs:
  - Asbestos waste at Tarro and Tomago
  - The former mineral sands processing facility at Tomago
  - Potentially impacted Hunter River sediments
  - Locations where construction works may interact with acid sulphate soils
- Medium risk AOPCRs:
  - Buried waste at Tomago
  - Industrial and commercial operations at Tomago and Heatherbrae (including potential PFAS contamination)
  - Raymond Terrace Wastewater Treatment Works
  - The Weathertex site in Heatherbrae
  - Along the Hunter River bank where herbicide has historically been applied
  - Illegally dumped waste at various locations within the construction footprint.

AOPCR that are not land use specific may also be present across the construction footprint. AOPCR are further described in detail in **Section 16.3.6**.

22.3.7 Subsidence risk

A search of the NSW Planning Portal on 6 July 2020 showed that the Black Hill Mine Subsidence District (administered by Subsidence Advisory NSW) is located immediately to the west of the project at Black Hill (refer to **Figure 14-5**).

Subsidence Advisory NSW records indicate that an un-remediated exploration shaft may be present near the intersection of the M1 Pacific Motorway and John Renshaw Drive at Black Hill north of the project.

22.3.8 Biosecurity risk

Within the vicinity of the project there are several primary production land uses such as grazing, forestry, horticulture and cropping. The majority of agricultural land in the vicinity of the project is used for grazing including areas at Black Hill, Tarro, Woodberry, Tomago, Heatherbrae, and Raymond Terrace. The land surrounding the project does not include any land mapped by DPIE as Biophysical Strategic Agricultural Land, that is, land with high quality soil and water resources capable of sustaining high levels of productivity.

Commercial fisheries are also present within the vicinity of the project, including prawn trawling and oyster aquaculture (refer to **Chapter 13** (socio-economic)).

Within NSW there are several pathogens that have the potential to impact agricultural activities and biodiversity. The project is located within the citrus red mite (*Panonychus citri*) biosecurity zone, which is located across the Central Coast region of NSW. Three pathogens that have the potential to impact biodiversity are also listed as a key threatening process under either the EPBC Act and/or TSC Act, and include:

- Dieback caused by *Phytophthora* (Root Rot; EPBC Act and TSC Act)
- Infection of frogs by amphibian chytrid fungus causing the disease chytridiomycosis (EPBC Act and TSC Act)
- Introduction and establishment of exotic Rust Fungi of the order *Pucciniales* on plants of the family *Myrtaceae* (TSC Act).

22.4 Assessment of potential impacts

22.4.1 Construction impacts

Public safety risks

Construction workplace hazards

Construction workplace hazards would be limited to the construction footprint. Generally, the risk is limited to the construction workforce within the construction footprint. Given the nature of a motorway construction site, potential construction workplace hazards to the construction workforce may include the following:

- Slips and trips from walking around the construction footprint
- Falls from height
- Fire or explosion
- Personnel struck by dropping or swinging loads or other objects
- Manual handling injuries
- Accidents involving vehicles, equipment and people
- Accidents involving vehicle to vehicle collisions
- Asbestos containing material
- Mobile plant interaction
- Electrocution or fire hazards
- Working near or over water.

These risks would be managed in accordance with the NSW *Work Health and Safety Act 2011* and the Work Health and Safety Regulation 2017.

Secure perimeter fencing would be installed to prevent unauthorised access to the construction footprint. As a result, the general public is not anticipated to have access to the construction footprint and safety risks to the general public would be limited to the environmental hazards and other safety risks described in the following subsections.

Environmental hazards

Health risks associated with the construction of the project may be present due to exposure to the following environmental hazards:

- Construction noise impacts
- Construction air quality impacts, including dust.

In summary, the highest impacts at residential receivers are generally in catchments where receivers are located close to the construction footprint. The highest construction noise impacts would occur during 'peak impact' activities, which would only occur for a relatively short period of time. However, high impacts may also occur at residential receivers during other construction activities, including during daytime, evening and night time periods. Other receivers that may also be impacted by noise from construction include educational facilities, places of worship, childcare centres, outdoor recreation areas and commercial and industrial receivers. Environmental management measures as described in **Section 8.6** will be implemented to minimise potential construction noise impacts. Construction noise impacts are further described in **Section 8.4**.

No adverse residual construction air quality impacts are anticipated given that dust impacts would be temporary and would be minimised with the implementation of environmental management measures. The environmental management measures that will be implemented to minimise potential construction air quality impacts are described in **Section 18.5**. Construction air quality impacts are further described in **Section 18.4**.

Road, pedestrian and cyclist safety

Construction of the project could result in an increased risk of vehicular, cyclist and pedestrian accidents. This increased risk is due to an increased number of vehicles, including heavy vehicles, in the local road network, along with changed traffic conditions (e.g. reduced speed limits, temporary signage and temporary traffic lane closures) near the project. To manage safety risks, temporary changes to roads would be audited in relation to road safety. A Traffic Management Plan and traffic control plans will be implemented during construction to ensure the safe movement of traffic, cyclists and pedestrians during construction, including the development of a response plan for any construction traffic incidents as described in **Section 7.7**.

Construction of the project would not impact any separated walking and cycling paths as described in **Section 5.4**. Given the lack of pedestrian infrastructure, pedestrian volumes are anticipated to be very low as described in **Section 7.4**. Where practical, minimum two-metre shoulders have been adopted for cycling access during construction. However, shoulders would be reduced for areas with limited clearance widths, which may pose an increased safety risk to cyclists.

Where construction activities impact pedestrian movements and cyclist access, pedestrian and cyclist traffic management would be implemented as part of the Traffic Management Plan and associated traffic con trol plans described in **Section 7.7**.

Bushfire risks

As the project would be located within and near bushfire prone land, the project has the potential to increase bushfire risk from accidental ignition. Potential bushfire risks could result from activities and materials used at ancillary facilities with increased fuel loads, the use of mobile equipment, fuels and

chemicals, and work on days that are classified as high fire risk. Construction ancillary facilities and construction infrastructure are temporary in nature and, where required, would be cleared of vegetation.

During construction, there would be impacts on roads in and next to the construction footprint including reduced speed limits and modified arrangements. This may delay response times and/or access for emergency services including fire crews, in the event of a bushfire. Construction personnel would be made aware of the potential for bushfires before working on the project. Measures to reduce bushfire risk during construction will be developed as described in **Table 22-3**.

Flood evacuation risks

During construction, there would be no change in total length of road impacted for the majority of named roads within the study area. There would be minor increases (up to 0.11 kilometres) in length of inundated roads at locations that are currently inundated during floods. Some roads would experience a decrease in length affected by flood hazard, an improvement when compared to the existing flooding conditions as described in **Section 10.5.3**. A new 46 metre section of the Pacific Highway at Tomago Road intersection would become cut-off in the 20% AEP event.

While traffic conditions as a result of project construction work could reduce capacity of existing evacuation routes, the minor change in the length of roads affected by flood hazard combined with minor changes in duration of inundation, would result in a negligible impact of flooding on emergency access and evacuation routes in up to the 5% AEP during construction (refer to **Section 10.5.3**).

Construction flood evacuation risks would be managed in accordance with the environmental management measures described in **Section 10.7**. Potential flood evacuation impacts during construction of the project are further described in **Section 10.5**.

Storage, handling and use of dangerous goods and hazardous material

Based on typical construction methods and maintenance requirements for similar projects, the dangerous goods and hazardous substances required for the project may include:

- Diesel fuels
- Oils, greases and lubricants
- Explosives
- Gases (oxy-Acetylene)
- Bitumen
- Paints and epoxies
- Herbicides
- Cement and concrete.

During construction, dangerous goods and hazardous substances are likely to be transported to and from and used within the construction footprint. Storage, handling and use of dangerous goods and hazardous substances may adversely impact human safety, either directly through contact, or indirectly through damage to the local environment, including the sensitive receiving environments described in **Section 10.3.2** and **Section 11.3.3**. This may impact construction workers and residents surrounding the construction footprint and haulage routes. The types of dangerous goods and hazardous substances that would be stored and used within each temporary ancillary facility would be dependent on the purpose of each temporary ancillary facility, as described in **Section 5.4.3**.

The storage, handling and use of dangerous goods and hazardous substances would be carried out in accordance with the *NSW Work Health and Safety Act 2011*, relevant Australian Standards and the environmental management measures described in **Table 22-3**. As such, the potential for impacts to construction workers and the environment is considered to be low.

Contamination hazards

Contaminants within AOPCR have potential to be exposed or disturbed by construction activities, such as excavation and ground disturbing works, dewatering activities, and dredging and bridge construction activities. This disturbance may result in risks of contaminant exposure to construction workers, road users and surrounding communities. Should asbestos be disturbed during construction, it can pose a health risk if inhaled into the lungs, potentially causing asbestosis, lung cancer and mesothelioma to workers or nearby residents (WorkCover NSW 2014).

Potential contamination hazards would be managed in accordance with the environmental management measures described in **Section 16.5**.

Subsidence risk

The construction footprint of the project would be located outside of the Black Hill Mine Subsidence District. As a result, no mine induced subsidence impacts are anticipated during operation of the project.

An un-remediated exploration shaft may be present within the John Renshaw Drive road corridor next to a site identified for use as an ancillary facility (AS1) during construction. The project would be located south of this location and is not likely to interact with this shaft, if present. No subsurface investigations to date have indicated the presence of a shaft in the project area. Additionally, the potential shaft is mapped in the vicinity of existing sub surface works carried out by Hunter Water Corporation for major utility mains, yet there is no known knowledge of a shaft in the construction footprint. Any potential residual risks surrounding this shaft would be managed by the contractor prior to and during construction.

Biosecurity risk

Biosecurity risks, including the introduction or spread of pathogens and diseases, may result in impacts to native vegetation, threatened fauna, agricultural activities and commercial fisheries during construction.

While the pathogens described in **Section 22.3** were not observed in the construction footprint during the biodiversity field surveys described in **Section 9.2**, pathogens may be transported by machinery or from fill sources during construction. About 1,080,000 cubic metres of imported fill would be required for the project. Where possible, fill material would be sourced from onsite. Imported fill will be sourced from quarries, local borrow pits and/or other sources, potentially including local mine backfill, former brick pits, interbedded sedimentary and volcanic rocks at Eagleton, coal ash, sand mines, and other projects. Fill and engineering materials from these sources are less likely to contain pathogens and diseases.

Environmental management measures, including the management of pest species and pathogens in accordance Guide 2: Exclusion zones of the RTA (2011) and the *Biosecurity Act 2015*, are described in **Section 9.5**. Given that none of the diseases and pathogens identified as having the potential to impact on biodiversity are waterborne, no biosecurity impacts to commercial fisheries or aquaculture are anticipated.

The citrus red mite feeds on the leaves, bark and fruit of citrus trees, and could result in biosecurity impacts to citrus plants and commercial orchards. As the project is not located in the vicinity of any citrus orchards, biosecurity impacts as a result of the citrus red mite are not anticipated. To prevent the potential spread of citrus red mite, no materials would be imported from citrus orchards or from sites adjacent to citrus orchards.

Construction of the project has the potential to introduce pathogens and disease, such as Phytophthora, amphibian chytrid fungus and exotic Rust Fungi, into the construction footprint and adjacent areas. While pathogens were not observed in the construction footprint the potential for pathogens to occur should be treated as a risk during construction as pathogens can be transported by machinery or vehicles. While forested areas are likely at greater risk from plant disease than the freshwater wetland areas of the construction footprint, all areas should be treated equally in terms of the potential risk and managing the

spread of pathogens and disease. Refer to **Chapter 9** (biodiversity) for the measures outlined to manage this risk.

Instream works that are required for the construction of the project have the potential to result in unplanned introduction and establishment of marine pest species to the Hunter River estuary and other aquatic environments within the construction footprint (refer to **Section 9.4.2**). Project activities within the Hunter River including the movement and use of the instream floating barge platforms and other vessels required for dredging presents the highest risk to aquatic biosecurity due to the potential for biofouling on external surfaces of vessels and within internal niche areas and systems, and through exchange of the vessel's ballast water. Other instream activities including piling, installation and use of temporary crossing structures and in situ concrete pouring and installation of precast concrete structures present a minor risk to aquatic biosecurity should equipment and/or materials be contaminated.

Potential biosecurity risks would be managed in accordance with the environmental management measures described in **Section 9.5**.

22.4.2 Operational impacts

Public safety risks

Operational workplace hazards

The potential workplace hazards to public safety that could occur during the operation of the project are related to road maintenance activities and include:

- Exposure to hazards associated with road safety: such as traffic accidents while performing maintenance activities near live traffic
- Exposure to hazards associated with utilities: such as exposure of workers, pedestrians and nearby residents to electrocution risks, fire risks and vehicle accidents.

Transport is experienced in road maintenance and has developed effective safety guidelines and procedures for all maintenance activities. With the effective implementation of these guidelines and procedures, the safety risk of operational workplace hazards would be low.

Fencing would be installed where required (refer to **Figure 5-1**) to prevent unauthorised access to the main alignment and other operational areas. Where water quality basins pose a risk to the general public, they will be fenced and/or have their access obstructed with traffic barriers. In addition, safety barriers and screens would be used as described in **Table 5-7**. As a result, the general public is not anticipated to have access to the main alignment except from the road corridor while driving or during a vehicle breakdown. Safety risks to the general public would be limited to the environmental hazards and other safety risks described in the following subsections.

Environmental hazards

Health risks associated with the operation of the project may be present due to exposure to the following environmental hazards:

- Road noise impacts
- Operational air quality impacts.

The predicted change in road traffic noise exposure as a result of the project is typically less than 2 dB(A) at about 83 per cent of the sensitive receivers within the study area for the assessment of operational traffic noise. This level of change in road traffic noise exposure is described by the NSW Road Noise Policy to be barely perceptible and is not anticipated to constitute an environmental hazard. Environmental management measures, as described in **Section 8.6** would be implemented to minimise potential operational noise impacts. Operational road noise impacts are further described in **Section 8.5**.

Operation of the project would lead to a redistribution of vehicle emissions across the road network, generally from existing main roads to the proposed new roads. The project is not expected to cause exceedances of the NSW EPA air quality impact assessment criteria for CO, NO_2, PM_{10}, $PM_{2.5}$ or key air toxics such as benzene and formaldehyde. Environmental management measures, as described in **Section 18.5** would be implemented to minimise potential operational air quality impacts. Operational air quality impacts are further described in **Section 18.4**.

Road, pedestrian and cyclist safety

The project would improve operational road safety for all users, including pedestrians and cyclists as described in **Section 7.5.8**. The project would achieve this by providing a motorway standard of design, including a dual carriageway with a median, an improved road alignment, wider lanes and shoulders and grade separated interchanges and reducing traffic volumes on the existing road network. As a result, the project would have a positive impact on road safety by addressing the following issues:

- Rear end, multi-vehicle crashes are the most common type of crash occurring within the traffic and transport study area. Many of these crashes occur on the New England Highway and Pacific Highway and are caused by traffic congestion. The project would reduce congestion on the New England Highway and Pacific Highway and is anticipated to result in a substantial reduction in rear-end type crashes
- Lane changes are the second most frequent type of crash in the traffic and transport study area with 66 per cent of these crashes occurring on the New England Highway. The project would reduce the number of vehicles travelling on the New England Highway which would reduce the risk of lane change crashes
- Access to and from the project is to be provided via grade-separated interchanges. This would reduce potential points of conflict between vehicles. Providing grade-separated interchanges would also result in free-flow conditions along the project, minimising the risk of congestion-related incidents
- Off road and off bend crashes are a common cause of fatal and serious injury crashes in the traffic and transport study area. The project provides improved road alignment, wider lanes and shoulders with barriers, and would minimise the risk and impact of any off-road crashes.

The project is also anticipated to improve pedestrian and cyclist safety.

The traffic and transport study area is predominantly comprised of industrial land uses which leads to very low volumes of pedestrians. The project would result in fewer traffic movements on the existing road network as traffic reroutes to the M1 Pacific Motorway.

The project would provide a shared path about 900 metres long along the southbound lane of Masonite Road in order to provide safer pedestrian access and to accommodate future development in the surrounding area. No shared path would be provided along the main alignment.

The proposed signalised intersection at the HRBG would provide a signalised pedestrian crossing which would provide access to the bus stop located on the eastern side of the Pacific Highway. It would also offer improved pedestrian access to the HRBG.

As a result, the project would provide safer access for pedestrians.

Cyclists would be able to use the 2.5 metre to three metre wide shoulders provided on the motorway and two metre to 2.5 metre wide sealed shoulders provided on ramps. This would improve cycle connectivity through the traffic and transport study area. Changes to the existing cycle network include:

- A signalised crossing at the M1 Pacific Motorway/John Renshaw Drive intersection with connectivity to the project to provide a safe crossing location for cyclists
- Relocating the existing cyclist crossing on the New England Highway, just east of John Renshaw Drive further west before the northbound entry ramp at the Tarro interchange
- Provision of a westbound cyclist crossing on the New England Highway across John Renshaw Drive

- Replacing the existing gore crossings at the Tarro interchange with new ramps which would create a link between the main alignment in both directions and the future Richmond Vale Rail Trail from Tarro to Shortland
- Provision for northbound cyclists on the Pacific Highway crossing to access Old Punt Road and for crossing from Old Punt to access the northbound Pacific Highway Carriageway
- Provision for northbound cyclists on Pacific Highway to access the main alignment at Tomago interchange and to connect to the traffic signals at Tomago Road
- Provision for northbound cyclists on Pacific Highway to access the HRBG
- Provision for a shared path over the realigned Masonite Road.

Overall, the project would provide additional cycling routes and enhanced safety for cyclists.

Bushfire risks

The operational infrastructure of the project is largely not vulnerable to bushfire due to its incombustible nature (road surface materials, retaining walls, road barriers). Bushfires may occur as a result of car accidents or littering (e.g. cigarette butts). However, landscape treatments would be appropriately designed along the road corridor to reduce potential fuel load, including use of low combustibility vegetation and regular maintenance (through slashing).

The clearing of vegetation for the project would create a fire break and result in a reduced risk of bushfires to the residential areas located adjacent to the main alignment. This would reduce the risk of bushfire, allowing for better containment. Water contained within the permanent operational water quality basins described in **Chapter 11** (surface water and groundwater quality) would be available to be used for emergency firefighting.

Access for emergency services would be improved by the operation of the project. In the instance that sections of the project are closed for safety reasons during a bushfire, the existing M1 Pacific Motorway would provide an alternate route for emergency and evacuation traffic.

Flood evacuation risks

The project would be the main emergency access and flood evacuation route for the surrounding area. The project would provide an improved road alignment and provide a new access route between Black Hill and Raymond Terrace, with flood immunity up to a 5% AEP event.

When operational, there would be no change in total length of road impacted for the majority of named roads within the study area. Minor increases (up to 0.09 kilometres) in length of inundated roads would occur at locations that are currently inundated during floods. Some roads would experience a decrease in total length of flooding, an improvement when compared to the existing flooding conditions. On minor roads, there is negligible change in operational flooding.

While a new 46 metre section of the Pacific Highway at Tomago Road intersection would become cut-off in the 20% AEP event, flooding would generally have a negligible impact on emergency access and evacuation routes in up to the probable maximum flood during project operation. The project would therefore provide some improvements of the trafficability of the Pacific Highway and New England Highway during operation.

Environmental management measures, as described in **Section 10.7** would be implemented to minimise potential operational flood evacuation risks. Potential flood evacuation impacts during operation of the project are further described in **Section 10.6.3**.

Storage, handling and use of dangerous goods and hazardous material

It is not anticipated that substantial volumes of dangerous goods or hazardous substances would be used for maintenance activities during operation of the project. However, dangerous goods and potentially hazardous materials would be transported along the M1 Pacific Motorway as part of the operational use of the project. The nature of the project means that there is an inherent risk of vehicle accidents and associated spillage associated with project operation.

Contaminants either directly associated with a spill or hazardous material clean-up may enter the receiving environment from both paved and unpaved surfaces. However, the potential for such a spill and consequential impacts is considered to be low due to the following factors:

- The high standard road design of the project would reduce the potential for road crashes in comparison to the existing situation
- The existing legislative controls on the transport of dangerous goods and hazardous materials
- In the unlikely event of a traffic crash involving a vehicle carrying dangerous goods or hazardous materials, any spills would typically be managed by the emergency services and the permanent water quality controls described in **Chapter 11** (surface water and groundwater quality).

The project has been designed to minimise and avoid impacts to the Tomago Sandbeds Catchment Area through directing runoff to permanent water quality basins, and the lining of all permanent water quality basins and swales within the Tomago Sandbeds Catchment Area, reducing the risk of spills entering a drinking water catchment. Water quality controls and impacts to the Tomago Sandbeds Catchment Area are further described in **Section 11.4**.

Environmental management measures, as described in **Table 22-3** would be implemented to minimise risks associated with the handling and use of dangerous goods and hazardous materials during operation.

Contamination hazards

Impacts to known areas of contamination would not be expected during operation of the project as suitable rehabilitation and revegetation activities would have been implemented to address areas disturbed during construction. Ongoing exposure of ASS would not be expected or required during project operation. While spills of contaminating materials from the project could potentially contaminate soil near roads associated with the project and adjacent areas, they are not anticipated to enter a drinking water catchment as described above. Environmental management measures, as described in **Section 16.5** would be implemented to minimise operational contamination hazards. Operational contamination impacts are further described in described in **Section 16.4**.

Subsidence risk

The operational footprint of the project is located outside of the Black Hill Mine Subsidence District. As a result, no mine induced subsidence impacts are anticipated during operation of the project.

It is anticipated that any potential risks surrounding the un-remediated exploration shaft would be resolved during construction. As a result, no residual risks surrounding this shaft are anticipated during operation of the project.

Biosecurity risk

Minimal native vegetation, threatened species and agricultural land would be disturbed during operation of the project as described in **Section 9.4** and **Section 14.4**. As a result, pathogens, diseases, and the citrus red mite, are considered unlikely to be transported by machinery during maintenance or by vehicle movements during operation.

22.5 Environmental management measures

The environmental management measures that will be implemented to minimise the safety and risk impacts of the project, along with the responsibility and timing for those measures, are presented in **Table 22-3**.

Table 22-3 Environmental management measures (safety and risk)

Impact	Reference	Management measure	Responsibility	Timing
Bushfire	HS01	A Bushfire Management Plan prepared in accordance with the Planning for Bush Fire Protection 2006 (Rural Fire Service 2006). Measures to be implemented to manage bushfire risk include: • Community notifications in the event of a bushfire • Ensuring plant and equipment are fitted with appropriate spark arrestors, where practicable • Ensuring site workers are informed of the site rules including designated smoking areas and putting rubbish in designated bins • Obtaining hot work permits and implementing total fire bans as required • Implementing adequate storage and handling requirements for potentially flammable substances in accordance with the relevant guidelines.	Contractor	Prior to construction
Subsidence risk	HS02	Potential residual risks surrounding the un-remediated exploration shaft near the John Renshaw Drive road corridor would be managed by the contractor.	Contractor	Prior to construction/ construction
Other relevant management measures				
Management of traffic during construction	TT01	A Traffic Management Plan (TMP) will be prepared and implemented in accordance with the Traffic Control at Work Sites Manual (Roads and Maritime Services 2018b) and QA Specification G10 Control of Traffic. The TMP will include: • Confirmation of haulage routes, including minimisation of haulage movements during peak periods on routes where feasible. • Access management plan to ensure access to properties can be maintained where it is safe and feasible during construction • Site specific traffic control measures (including signage) to manage and regulate traffic movement • Measures to manage temporary changes to the road network including use of barriers, lane occupancies or temporary road closures • Measures to maintain pedestrian and cyclist access (including communication, signage and alternative routes)	Contractor	Prior to construction/ construction

Impact	Reference	Management measure	Responsibility	Timing
		• Requirements and methods to consult and inform the local community of impacts on the local road network (including for out of hours work) • Access to ancillary and 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.		
Emergency vehicle access	TT05	Where possible, access for emergency vehicles will be maintained at all times during construction. Any site-specific requirements will be determined in consultation with the relevant emergency services agency.	Contractor	Construction
Flooding impacts during construction	FH01	A Flood Management Plan (FMP) will be prepared for the project and will detail the processes for flood preparedness, materials management, weather monitoring, site management and flood incident management. The FMP will also address procedures and responsibilities for flood response (preparation of site upon receipt of flood warning, evacuation of site personnel) during and recovery following a flood event. The FMP will also include: • Consideration of temporary traffic arrangements to minimise impact on flood evacuation route traffic capacity. • Appropriate measures to manage potential flood impact associated with temporary ancillary facilities subject to flooding within 20% AEP flood level • Where feasible, the size of the ancillary facilities and the height and extent of temporary access tracks will be reduced to minimise flood impacts • Ancillary facilities will also be designed to provide for conveyance of flood flows in order to minimise flooding impacts to adjacent properties and environment.	Transport / Contractor	Prior to construction

Impact	Reference	Management measure	Responsibility	Timing
General	WQ01	A Construction Soils and Water Management Plan (CSWMP) would be developed as a sub plan of the CEMP and will outline measures to manage soil and water quality impacts associated with the construction work, including contaminated land. The CSWMP would include but not be limited to: • Measures to minimise/manage erosion and sediment transport both within the construction footprint and offsite including requirements for the preparation of erosion and sediment control plans (ESCP) for all progressive stages of construction and the implementation of erosion and sediment control measures • Erosion and sediment control measures, which will be implemented and maintained in accordance with Managing Urban Stormwater – Soils and Construction, Volume 1 (Landcom 2004) and Volume 2D (DECC 2008) • Measures to manage stockpiles including locations, separation of waste types, sediment controls and stabilisation in accordance with the Stockpile Site Management Guideline (Roads and Maritime Services 2015e). • Procedures for dewatering (including waterways, wetlands and excavations and temporary sediment basins) including relevant discharge criteria. • Concrete waste management procedures • Measures to manage accidental spills including the requirement to maintain materials such as spill kits, an emergency spill response procedure and regular visual water quality checks when working near waterways • Measures to manage tannin leachate and potential saline soils • Controls for sensitive receiving environments which may include but not be limited to identification of 'no go' zones for construction plant and equipment (where applicable).	Contractor	Prior to construction/ construction/ operation
Invasion and spread of weeds	B11	Weed species will be managed in accordance with 'Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects' (RTA 2011) (Guide 6: Weed management).	Contractor	Construction
Invasion and spread of pest animal, pathogens and disease	B12	Pest species and pathogens will be managed in accordance Guide 2: Exclusion zones of the 'Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects' (RTA 2011), the Commonwealth *Biosecurity Act 2015,* NSW *Biosecurity Act 2015* and where relevant, the Australian Ballast Water Management Requirements.	Contractor	Construction