

# Chapter 23

## Hazard and risk

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## 23 Hazard and risk

**This chapter provides an assessment of environmental hazards and risks that could arise during construction and operation of the project, and management strategies to address these hazards and risks.**

### 23.1 Overview

Potential temporary environmental hazards and risks associated with the on-site storage, use and transport of chemicals, fuels and materials would be managed through standard mitigation measures which would include the storage and management of all hazardous substances in accordance with the *Work Health and Safety Act 2011* (NSW), the *Storage and Handling of Dangerous Goods Code of Practice* (WorkCover NSW, 2005) and *Hazardous and Offensive Development Application Guidelines: Applying SEPP 33* (Department of Planning, 2011) (Applying SEPP 33).

The railway viaduct has been designed to have sufficient clearance over the Warragamba to Prospect Water Supply Pipelines to minimise the risk of damage or rupture of the pipeline, in accordance with the *Guidelines for Development Adjacent to the Upper Canal and Warragamba Pipelines* (WaterNSW, 2020). A detailed construction vibration assessment would be undertaken for the pipelines to confirm impacts during further design development, and vibration monitoring would be undertaken and reported to WaterNSW during construction. The track alignment is relatively straight on approach to the pipelines, as well as where the viaduct track crosses above the pipelines. Safety barriers would be installed on the viaduct to prevent impacts associated with derailment. In addition, regular track inspections and maintenance would be carried out. Sydney Metro would continue to develop construction planning and the design of the project to minimise risks in consultation with WaterNSW.

The project is located in tunnel between St Marys and Orchard Hills and between Western Sydney International and Bringelly, which mitigates potential bushfire risks in these areas. A Bushfire Management Plan would be prepared for both construction and operational phases to manage bushfire risk and response actions.

A key metro characteristic is to provide a system that is inherently safe for customers on trains, at stations, and at the interface with the public domain. The safety of passengers and the general public has been, and would continue to be, a key consideration during the design process.

### 23.2 Assessment approach and legislative context

#### 23.2.1 Off-airport

A desktop assessment was carried out to identify environmental and community hazards and risks that could arise during construction and operation of the project off-airport, as well as management measures to address potential issues.

The assessment focused on hazards and risks with the potential to adversely affect the quality of the surrounding environment, land uses and communities, with consideration of the following relevant guidelines:

- Applying SEPP 33
- *Dangerous Goods (Road and Rail Transport) Act 2008* (NSW)
- *Australian Code for the Transport of Dangerous Goods by Road and Rail* (Edition 7.6) (National Transport Commission, 2018)
- *Storage and Handling of Dangerous Goods Code of Practice*
- *National Airport Safeguarding Framework* (NASF) (Department of Infrastructure, Transport, Cities and Regional Development, 2018)
- *Recommended Practices No. 1 – Standards for Aerodrome Bird/Wildlife Control* (International Birdstrike Committee, 2006)
- *Guidelines for Development Adjacent to the Upper Canal and Warragamba Pipelines*

- *International Standard (ISO 31000:2018) Risk Management Guidelines*
- Work Health and Safety and Regulation 2011 (NSW)
- bushfire prone land mapping developed and published by the NSW Rural Fire Service.

A qualitative assessment was also undertaken to identify construction and operational activities with the potential to cause risks to public health and safety.

### **23.2.2 On-airport**

A desktop assessment was carried out to identify environmental hazards and risks that could arise during construction and operation of the project's on-airport components, as well as the management measures to address potential issues.

The assessment focused on hazards and risks with the potential to adversely affect the quality of the surrounding environment, land uses and communities. In addition to the guidelines identified in Section 23.2.1, the following legislation was considered:

- *Airports Act 1996* (Cth) (the Airports Act)
- Airport (Environment Protection) Regulations 1997 (Cth).

A key input to the desktop assessment was a review of the hazards and risks identified in the *Western Sydney Airport – Environmental Impact Statement* (Department of Infrastructure and Regional Development, 2016b) and the *Western Sydney Airport Stage 1 Construction Plan* (Western Sydney Airport, 2019) and consideration of how the project would change or contribute to the on-airport hazards and risks.

The project would be constructed at a similar time to construction of Stage 1 of Western Sydney International. Initial earthworks and clearing to support construction site establishment for Western Sydney International would generally be completed or almost complete when construction activities for the project commence.

## **23.3 Potential impacts – construction**

### **23.3.1 Off-airport**

Potential temporary hazards and risks during off-airport construction would include:

- on-site storage, use and transport of dangerous goods and hazardous substances
- rupture of, or interference with, underground utilities
- damage to major transport, water and power infrastructure traversed by the project, in particular the Warragamba to Prospect Water Supply Pipelines, a critical piece of water supply infrastructure for Sydney
- risk of damage to existing building basements and ground support structures due to ground movement and geotechnical uncertainty
- bushfire risks
- structural risks and exposure to hazardous materials and any contaminated soils during demolition and construction works
- health impacts from noise and air pollution during construction
- reduced safety for road users and pedestrians during construction.

Land uses and receivers for the potential temporary impacts identified vary throughout the project footprint and include:

- St Marys and north of the M4 Western Motorway – St Marys Town Centre (a local retail/commercial centre) which is surrounded by primarily residential, education and open space and recreation areas, as well as educational, low density residential and open space land further south of the Town Centre

- Orchard Hills to Western Sydney International – comprising semi-rural and rural residential properties with some small scale agricultural land uses, patches of bushland and waterways present. The rural land uses are traversed by a number of infrastructure elements including the Warragamba to Prospect Water Supply Pipelines
- Bringelly to Aerotropolis Core – comprising primarily rural industries and rural-residential properties.

Construction of the project is expected to be completed prior to the opening of Western Sydney International, and therefore airspace obstructions are not expected to be a potential risk.

Flooding risks have been assessed in Chapter 14 (Flooding, hydrology and water quality) and climate change risks have been assessed Chapter 17 (Sustainability, climate change and greenhouse gas).

### **On-site storage, use and transport of dangerous goods and hazardous substances**

#### *Potential risks*

Potentially dangerous goods and hazardous substances are anticipated to be temporarily used, stored and transported during construction of the project. The potentially hazardous materials include petrol, diesel, lubricating and hydraulic oils and greases, industrial grade oxygen, acetylene, cement, premix concrete, concrete curing compounds, concrete retardant, shotcrete accelerator, epoxy glue, coagulants, acids, bases, disinfectant, antiscalant, membrane preservative, de-bonding agents, contaminated waste and paints.

The method of storage would vary depending on the materials but would include drums of various sizes, small and intermediate bulk containers, cylinders in racks, bags/pallets and banded areas where appropriate.

Typically, low volumes of potentially hazardous materials, such as diesel, petrol, lubricants and paints, would be stored on-site, with the exception of the Orchard Hills construction site and Western Sydney International tunnel portal site where larger volumes of materials would be required to support tunnel construction. The volume required to be stored on-site would largely depend on the anticipated rates of consumption, with deliveries of dangerous goods coordinated to match consumption rates.

#### *How potential risks and impacts would be managed*

Construction site planning would ensure hazardous materials are stored appropriately and at an appropriate distance from sensitive receivers, in accordance with the thresholds established under Applying SEPP 33. Should the minimum buffers be unable to be maintained a risk management strategy would be developed on a case-by-case basis.

Environmental hazards and risks associated with the on-site storage, use and transport of chemicals, fuels and materials would be managed through standard mitigation measures to be developed as part of the construction environmental management documentation (refer to Chapter 25 (Environmental management and mitigation)). These measures would include the storage and management of all hazardous substances in accordance with the guidelines referenced in mitigation measure HR1 (see Section 23.5.1), so that they do not cause a significant off-site risk.

### **Rupture of, or interference with, underground utilities**

#### *Potential risks*

A number of utilities would need to be adjusted, relocated and/or protected to enable construction of the project as outlined in Chapter 8 (Project description – construction). Construction of the project would also involve provision of temporary power supply, for example to support the tunnel boring machine at the Orchard Hills construction site, as well as construction of a permanent power supply connection to the stabling and maintenance facility.

Damage, rupture and/or failure to shut down or isolate underground utilities during construction of the project has the potential to result in the following environmental hazards and risks:

- release of untreated sewage and/or gas from a sewer main, and potential impacts on water mains and drains
- release of natural gas from a gas main

- release of large electrical currents through the ground surface from an underground electricity cable (known as earth potential rise).

*How potential risks and impacts would be managed*

Potential risks associated with these hazards would be minimised by carrying out utility checks (such as Dial Before You Dig searches and non-destructive digging), consulting with relevant utility providers and, if required, relocating and/or protecting utilities in and around the project prior to construction. Consultation with utility providers would commence during design development and continue during construction to mitigate the risk of unplanned and unexpected disturbance of utilities.

A utilities coordination manager would be appointed for the project to coordinate the delivery of the utility works. The utilities coordination manager would help identify and manage risks associated with the project's potential impact on existing utilities.

**Damage to major transport, water and power infrastructure traversed by the project**

*Potential risks*

The project crosses a number of major assets of critical importance to metropolitan Sydney including:

- the T1 Western Line (construction interface at the proposed St Marys Station) – while impacts on the operation of the rail line (such as rail shutdowns) would be unavoidable during certain construction stages (as discussed in Chapter 8 (Project description – construction)), these would be minimised. However, there are risks associated with damage to existing rail infrastructure leading to greater impacts on existing rail services
- the M4 Western Motorway, Great Western Highway and Badgerys Creek Road (project constructed in bored tunnel below) – risks are associated with subsidence as a result of tunnelling
- the Warragamba to Prospect Water Supply Pipelines (project constructed on viaduct over the pipelines) – the most significant potential risk given the critical role of the pipelines in Sydney's water supply and the exposed (above-ground) nature of the pipe leading to risk of damage or rupture of the pipelines.

*How risks would be managed*

Mitigation measures proposed to minimise the risk of settlement during construction, including further detailed geotechnical assessments, are provided in Chapter 15 (Groundwater and geology).

The railway viaduct has been designed to have sufficient clearance over the Warragamba to Prospect Water Supply Pipelines to minimise the risk of damage or rupture of the pipelines, in accordance with the Guidelines for Development Adjacent to the Upper Canal and Warragamba Pipelines. These guidelines also provide an overview of issues to be considered for development adjacent to the pipelines, including vibration impacts and buffer areas for excavation works. The project would address these issues and mitigate the risk of damaging the pipelines by implementing a range of mitigation measures, including (but not limited to):

- site speed restriction and concrete barriers along haulage routes to minimise risk of vehicle strike to the pipelines
- installation of a working platform above the pipelines during construction of the railway viaduct to minimise the risk of objects falling onto the pipe
- prevent undermining of pipelines, for example by underpinning pipeline cradles during excavation and stabilising excavation area so it does not affect pipeline cradles.

Additional chapters which contain an assessment and mitigation measures for other potential risks to the Warragamba to Prospect Water Supply Pipelines during construction include:

- Chapter 10 (Noise and vibration), specifically for measures to avoid vibration impacts to the pipelines
- Chapter 12 (Non-Aboriginal heritage), specifically for an assessment of potential impacts to the State heritage significance of the pipelines

- Chapter 14 (Flooding, hydrology and water quality), specifically for an assessment of, and measures proposed, to avoid surface water flows into and across the corridor
- Chapter 15 (Groundwater and geology), specifically for an assessment of, and measures proposed, to avoid groundwater flows across the corridor.

Sydney Metro would continue to develop its construction planning approach to minimise risks in consultation with WaterNSW, including planning to maintain access to the pipelines for WaterNSW and its contractors, and to ensure no public entry to the pipeline corridor.

## **Bushfire risks**

### *Potential risks*

The project traverses both highly developed urban environments (particularly at St Marys), semi-rural and rural residential areas (which comprise a higher proportion of vegetation including native vegetation). The semi-rural and rural-residential areas around Orchard Hills, Luddenham, Badgerys Creek and Bringelly are characterised by a predominantly cleared and disturbed rural landscape with interspersed stands of native vegetation, mostly located around waterways. There are also some larger remnant patches of vegetation within the Defence Establishment Orchard Hills site.

Figure 23-1 shows bushfire prone land (Category 1 and 2 vegetation) in the vicinity of the project. Category 1 vegetation is considered to be the highest risk for bushfire. Category 2 is considered to be of lower bushfire risk, but higher than areas not mapped as bushfire prone.

Construction of the project has the potential to temporarily provide sources of ignition including sparks from the use of construction equipment, hot lighting or halogen lighting. Under high winds, these sources of ignition could allow a fire to escape off-site.

### *How potential risks and impacts would be managed*

A Bushfire Management Plan would be prepared and implemented to manage bushfire risk and identify response actions during construction of the project. The Plan would be prepared in consultation with the NSW Rural Fire Service. Overall, bushfire risks during construction are considered to be low provided a Bushfire Management Plan is successfully implemented.

## **Risk of damage to existing building basements and ground support structures due to ground movement**

### *Potential risks*

An assessment of potential settlement impacts associated with the project is provided in Chapter 15 (Groundwater and geology). Ground movement may occur in some areas as a result of construction works for different elements of the project including tunnelling, excavation of cut and cover structures for stations and shafts for services facilities. It may also occur as a result of groundwater drawdown.

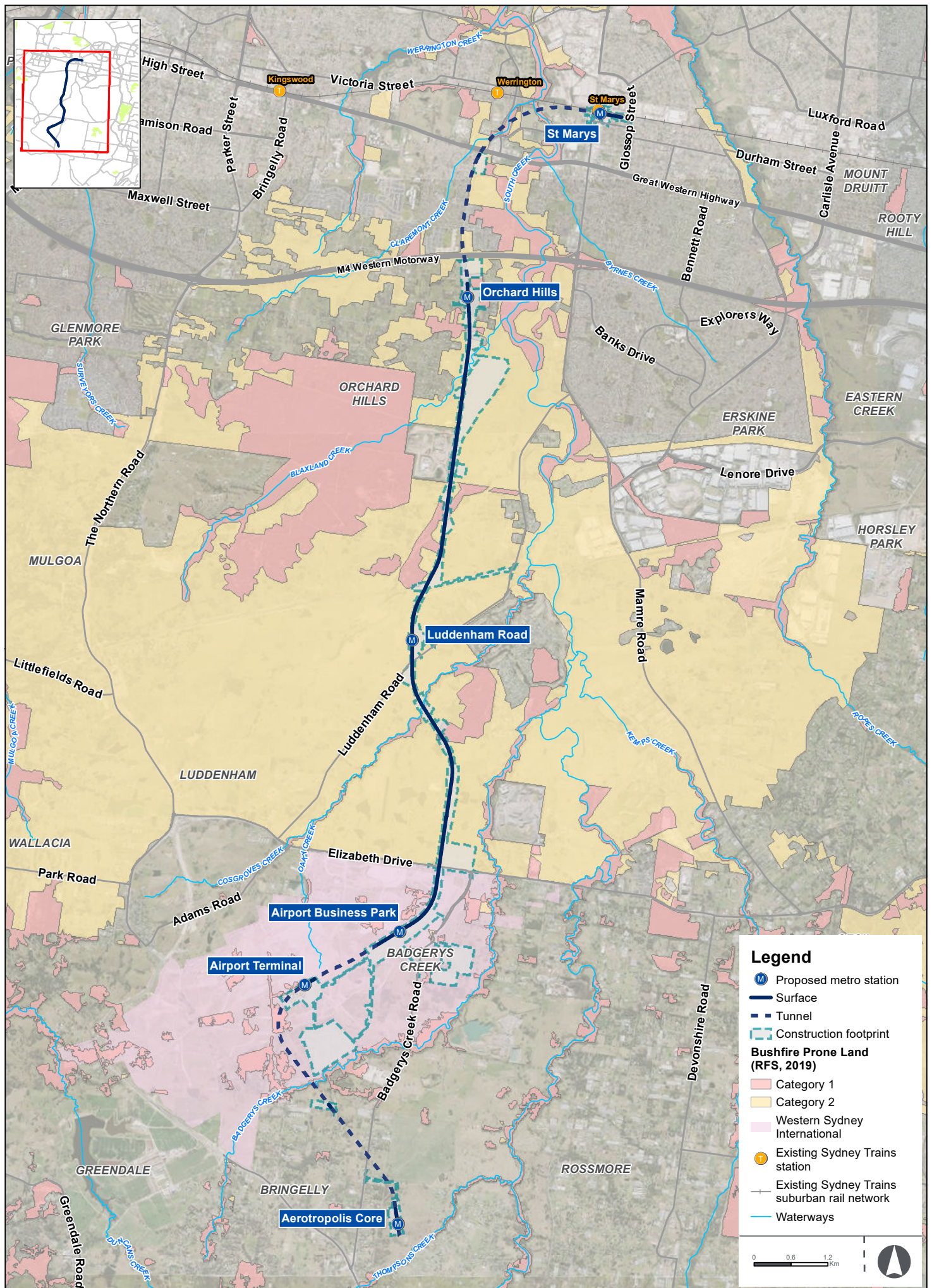
Areas most likely to be affected by ground movement would include where tunnelling is closest to the ground surface (shallowest), at cut and cover stations (St Marys, Orchard Hills and Aerotropolis Core) and at the Claremont Meadows and Bringelly services facilities. Ground movement can potentially impact on buildings (including heritage items), roads, railway lines, bridges and utilities.

### *How potential risks and impacts would be managed*

Mitigation measures proposed to minimise the risk of settlement during construction, including further detailed geotechnical assessments, are provided in Chapter 15 (Groundwater and geology).

Further geotechnical and groundwater investigations would be carried out to improve understanding of ground conditions and reduce settlement risks. Standard settlement criteria would also be applied during construction of the project.





Bushfire prone land along the project footprint

**Figure 23-1**

Indicative only, subject to design development



## **Removal of buildings and structures**

### *Potential risks*

Construction of the project requires the removal of buildings and structures particularly in the areas of St Marys, Orchard Hills and Bringelly (refer to Section 8.9.2). Potential hazards and risks associated with building demolition include:

- unplanned structure collapse
- workers falling from one level to another
- falling objects
- impacts on nearby above ground and underground services
- exposure to any hazardous chemicals and materials (such as asbestos fibres, lead dust, and biological material)
- noise from plant used in demolition work
- proximity of the demolition works to other buildings or structures.

### *How potential risks and impacts would be managed*

To minimise exposure to these hazards and risks, a risk assessment would be carried out prior to works commencing which would include:

- an assessment of the structural integrity of the structure to be demolished
- an assessment of the method of demolition, including sequencing, scheduling, plant and equipment, and the layout of work areas
- a hazardous material survey for those buildings and structures suspected of containing hazardous materials (particularly asbestos).

Demolition would be carried out by licensed demolition contractors, in accordance with relevant regulatory requirements.

## **Contamination risk**

### *Potential risks*

The main contaminants of potential concern that could be exposed during excavation works for the project include hydrocarbons, heavy metals, and asbestos (refer to Chapter 16 (Soils and contamination)). Areas of past or current rural land use may have soils with pesticide and herbicide residues. There may be a range of other industrial contaminants associated with the St Marys commercial and industrial area and the closed Gipps Street landfill. The landfill poses a contamination risk due to the potential for contaminated leachate to impact on groundwater in the vicinity of proposed tunnelling and also through the off-site migration of landfill gases.

Potential contamination and unexploded ordnance may be associated with Defence Establishment Orchard Hills due to past military activities.

Exposure to these contaminants could cause potential health and safety impacts on the community through inhalation, incidental ingestion, direct contact, and/or impacts on the environment due to contamination of land and/or groundwater. Landfill gases could pose an explosive risk for intrusive works close to the closed Gipps Street landfill.

### *How potential risks and impacts would be managed*

Environmental, health and safety impacts associated with potential exposure to contaminated and hazardous materials would be minimised through carrying out detailed visual site investigations for sites assessed as medium risk (which may be followed by targeted sampling if visual inspections identify potential areas of contamination). Detailed site investigations would be carried out for sites assessed as high risk, prior to construction. An unexpected finds protocol and waste management plan would be implemented during construction for project areas including low risk sites.

During construction, the tunnels would be progressively lined with concrete segments which would prevent the ingress of contaminated groundwater. Any short-term ingress of groundwater during construction would be captured and directed to construction water treatment plants and appropriately treated prior to discharge. Groundwater monitoring would be undertaken prior to and during construction of the project.

Contaminated waste (such as waste containing asbestos) would be removed and disposed of in accordance with the relevant legislation, codes of practice and Australian Standards (including the Work Health and Safety and Regulation).

Further information on contamination and associated mitigation measures is provided in Chapter 16 (Soils and contamination).

### **Other construction health and safety risks**

#### *Potential risks*

Other construction activities that could result in temporary potential impacts on the health and safety of users, visitors, and the local community if not properly managed include:

- the operation of vehicles and construction equipment on-site
- the transportation of equipment, excavated spoil, and material to and from the site
- health impacts from noise and air pollution during construction
- reduced safety for road users and pedestrians during construction
- construction failures or incidents resulting in flooding, inundation, or excavation collapse
- cumulative construction impacts or increased construction-related risks resulting from concurrent construction of other projects, including the future M12 Motorway and Western Sydney International.

In addition, there is the potential for risks to pedestrians/public safety resulting from unauthorised access to construction work areas. NSW workplace safety laws require construction sites to have adequate site security including appropriate fencing.

#### *How potential risks and impacts would be managed*

All construction work would be isolated from the general public. The construction contractor would ensure that construction sites are secure at all times, and take all possible actions to prevent entry by unauthorised persons.

Health and safety risks during construction would be managed by the implementation of standard workplace health and safety requirements. A work health and safety management plan and safe work method statements would be developed in accordance with regulatory requirements.

There are interactions between the mitigation and management measures for public hazards, risks and safety, traffic and transport, noise and vibration, flooding, hydrology and water quality, air quality, soils and contamination, and waste impacts. Chapter 27 (Synthesis) provides a consolidated list of environmental mitigation measures for the project. Together, these measures would minimise the potential hazard and risk impacts on the community and environment.

Cumulative construction impacts or increased construction-related risks resulting from the concurrent construction of other projects (such as the future M12 Motorway and Western Sydney International) are discussed in Chapter 24 (Cumulative impacts). Construction planning for the project has involved consultation with the respective proponents of other infrastructure projects to avoid construction conflicts where possible and minimise cumulative construction impacts. This consultation would be ongoing through to the design development and construction phases of the project.

### 23.3.2 On-airport

Potential on-airport hazards and risks identified for the project during construction would be as per the off-airport hazards and risks identified in Section 23.3.1. The following sections provide additional assessment of on-airport specific hazards and risks.

Construction of the project would be completed prior to the opening of Western Sydney International, therefore construction of the project would not be a potential risk to airspace and airport operations.

#### **Bushfire risk**

##### *Potential risks*

Construction would occur within and adjacent to the Western Sydney International Stage 1 Construction Impact Zone. Bushfire prone land is mapped within the airport site, as shown in Figure 23-1.

Much of the existing vegetation is likely to be cleared at the time of construction of the project as a result of bulk earthworks associated with Stage 1 construction of the airport. Areas within the airport site that would not be cleared of vegetation as part of the Stage 1 construction would include the Environmental Conservation Zone (refer to Figure 3-2 in Chapter 3 (Project location and setting)) and other areas outside the Stage 1 Construction Impact Zone.

Construction of the project has the potential to provide sources of ignition including sparks from the use of construction equipment, or hot or halogen lighting. Under adverse winds, these sources of ignition could allow a fire to escape off-site.

##### *How potential risks would be managed*

A Bushfire Management Plan would be prepared and implemented to manage current bushfire risk and identify response actions during construction of the project, including on-airport components of the project. The Plan would be prepared in consultation with the NSW Rural Fire Service and Western Sydney Airport. For project areas within Western Sydney International, the Plan would be prepared having regard to the existing *Western Sydney Airport Site at Badgerys Creek Bushfire Risk Management Plan* (Western Sydney Airport, 2019k).

#### **Rupture of, or interference with, underground utilities**

##### *Potential risks*

Power, communications and stormwater infrastructure is located within the construction footprint on-airport. Construction of the project would also involve provision of temporary power supply to the Western Sydney International tunnel portal construction site to support the tunnel boring machines.

Damage, rupture and/or failure to shut down or isolate underground utilities during construction of the project has the potential to result in the following environmental hazards and risks:

- release of untreated sewage and/or gas from a sewer main, and potential impacts on water mains and drains
- release of large electrical currents through the ground surface from an underground electricity cable (known as earth potential rise).

##### *How potential risks and impacts would be managed*

Potential risks associated with utilities on-airport would be minimised by carrying out utility checks (such as Dial Before You Dig searches and non-destructive digging) and if required, relocating and/or protecting utilities in and around the project prior to construction. Sydney Metro would continue to consult with Western Sydney Airport to identify the management approach for utilities on-airport.

## Contamination risks

### *Potential risks*

Potential contaminants associated with prior rural, commercial and light industrial land uses have been identified at Western Sydney International (refer to Chapter 16 (Soils and contamination)). The main contaminant of potential concern that could be exposed during excavation works for the project is asbestos in soil. Localised areas of petroleum hydrocarbon and heavy metal contamination in soil have also been identified.

Exposure to these contaminants could potentially cause health and safety impacts on the community in the event of mobile contaminants impacting off-airport sensitive receivers, or impacts on the environment due to contamination of land.

### *How potential risks would be managed*

Environmental and human health risks associated with potential exposure to contaminated and hazardous materials on-airport would be minimised through implementation of a project-specific Remediation Action Plan (Sydney Metro Remediation Action Plan), as well as the implementation of an unexpected finds protocol and waste management plan. The Sydney Metro Remediation Action Plan would be prepared in a manner consistent with the *Western Sydney Airport Remediation Action Plan* (Department of Infrastructure and Regional Development, 2019) to the extent practicable, and would be applied to any contamination encountered by Sydney Metro that has not been remediated by Western Sydney Airport.

Contaminated waste (such as waste containing asbestos) would be removed and disposed of in accordance with the relevant legislation, codes of practice and guidelines. Further information on contamination, and associated mitigation measures, is provided in Chapter 16 (Soils and contamination).

## Other construction health and safety risks

### *Potential risks*

Other construction activities could also result in temporary impacts on the health and safety of users, visitors, and the local community if not properly managed. Potential impacts would be similar to those identified for off-airport, however, risks may be higher due to construction activities being concurrent with the Stage 1 construction works for Western Sydney International. Specific potential health and safety construction risks are provided in Section 23.3.1.

### *How potential risks and impacts would be managed*

The management of other potential construction health and safety risks would generally be consistent with the off-airport approach, detailed in Section 23.3.1.

However, on-airport works would be within the existing airport site, which is currently inaccessible to the public and is subject to controlled access by Western Sydney Airport for approved personnel. This would help minimise safety risks during construction as the site is isolated from the general public, and would not pose a risk to road users and pedestrians.

## 23.4 Potential impacts – operation

### 23.4.1 Off-airport

Potential hazards and risks during operation would be associated with:

- on-site storage, use and transport of dangerous goods and hazardous substances
- provision of new traction substations which have the potential to introduce risks associated with electric and magnetic field during operation
- potential for train strike for pedestrians in the event of trespass in the rail corridor
- bushfire risks
- train or station fire

- damage or rupture of the Warragamba to Prospect Water Supply Pipelines
- airspace obstructions and safety.

These hazards and risks are described further in the following sections. The ongoing development of the Western Parkland City may introduce other hazards and risks which have the potential to impact on the operation of the project, or the project may impact on those developments. These potential risks would be assessed in the relevant planning approvals for those developments.

Flooding risks are assessed in Chapter 14 (Flooding, hydrology and water quality) and climate change risks are assessed in Chapter 17 (Sustainability, climate change and greenhouse gas).

### **On-site storage, use and transport of dangerous goods and hazardous substances**

#### *Potential risks*

Potentially dangerous goods and hazardous substances are anticipated to be used, stored and transported during operation of the project, including sodium hydroxide, poly-aluminium chloride and polymer.

These materials would likely be stored at:

- the stabling and maintenance facility at Orchard Hills
- the water treatment plants proposed at St Marys Station and the Bringelly services facility.

Operational water treatment plants for the project would require the storage, use and transport of several chemicals for the treatment tanks. Water quality treatment basins are also proposed at the stabling and maintenance facility for train wash purposes.

#### *How potential risks and impacts would be managed*

Potential environmental hazards and risks associated with the on-site storage, use and transport of chemicals, fuels and materials would be managed through standard mitigation measures to be developed as part of the operational environmental management system. These measures would include the storage and management of all hazardous substances in accordance with the guidelines referenced in mitigation measure HR1 (see Section 23.5.1), so that they do not cause a significant off-site risk.

### **Bushfire risks**

#### *Potential risks*

As discussed in Section 23.3.1, the project traverses areas of land mapped as bushfire prone (see Figure 23-1). Operation of the project has the potential to provide sources of ignition, such as operation of substations, electrical cabling, maintenance works and replacement or repairs of infrastructure. Under adverse winds, these sources of ignition could allow a fire to escape off-site. The project is located in tunnel between St Marys and Orchard Hills and between Western Sydney International and Bringelly, which mitigates bushfire risks in these areas.

#### *How potential risks and impacts would be managed*

A Bushfire Management Plan would be prepared and implemented to manage current bushfire risk and identify response actions during operation of the project. The Plan would be prepared in consultation with the NSW Rural Fire Service. Overall, bushfire risks during operation are considered to be low, provided a Bushfire Management Plan is implemented.

### **Airspace obstructions and safety**

The Airports Act and the Airports (Protection of Airspace) Regulations 1996 (Cth) (Airspace Regulations) enable the protection of airspace at and around regulated airports in Australia. The Airspace Regulations define the 'prescribed airspace' for airports as the airspace above any part of either an obstacle limitation surface (OLS), procedures for air navigation systems operations (PANS-OPS) surfaces, or any other airspace declared to be prescribed for the airport under the Airspace Regulations.



Approvals under Part 12 of the Airports Act relate to intrusion into prescribed airspace by physical structures or other impacts including from emissions from smokestacks or vents. The project would not obstruct protected airspace and would therefore not require separate approvals. The design development of the project would comply with OLS requirements. The OLS area for Western Sydney International is shown in Figure 23-2.

Public Safety Areas (PSA) defined under the NASF Guideline I, are designated areas of land at the end of an airport runway within which development may be restricted to control the number of people in the area. The size and shape of a PSA typically depends on the likelihood of an aircraft accident occurring (for example, a plane overshooting the runway). Generally, this likelihood decreases with increasing distance from the runway.

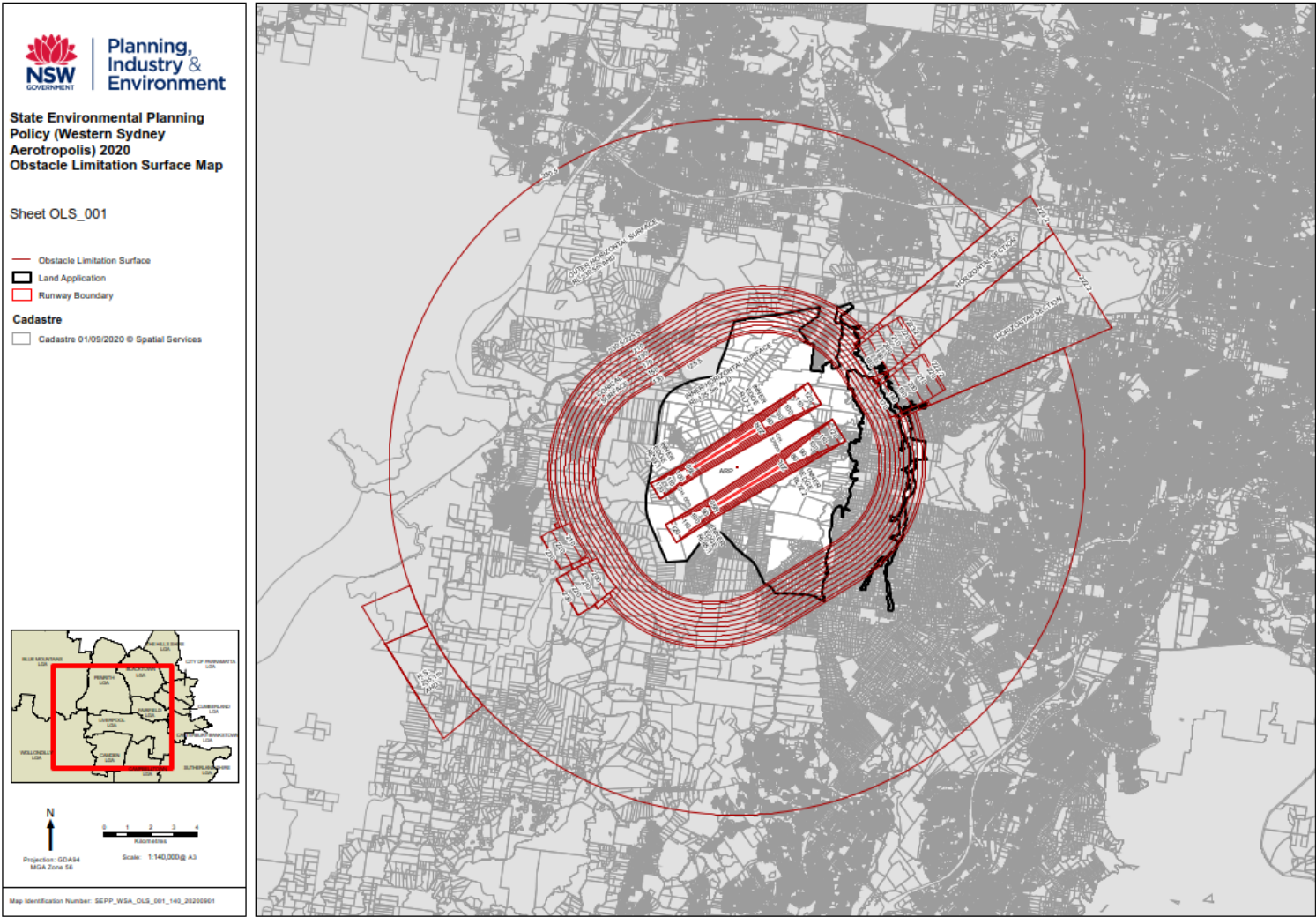
The *Western Sydney Aerotropolis Plan* (NSW Government, 2020) has adopted a PSA based on the UK Public Safety Area model. The PSA extends from the end of Runway 1, beyond the boundary of the airport site to the north of Elizabeth Drive (see Figure 23-3). The project crosses through the PSA for Runway 1 for around 400 metres.

Potential risks and options for the realignment of the project (both horizontal and vertical) have been considered in determining the project alignment presented in this Environmental Impact Statement, while noting station locations are fixed at the Airport Business Park and Airport Terminal. The development of the project alignment has considered the crossing of the future M12 Motorway to the north, the crossing of Elizabeth Drive to the south and the vertical alignment of the rail corridor within Western Sydney International (i.e. in-tunnel south of Airport Business Park Station, including under Badgerys Creek). No physical risk mitigation (such as barriers) is considered necessary as part of the design.

The landscape design for the project would include consideration of appropriate species lists to minimise opportunities to attract wildlife at levels likely to present a hazard to aviation operations. The landscape design would have regard to relevant requirements and species lists under Western Sydney Airport's Wildlife Management Plan and other relevant guidelines, including the NASF Guideline C and Recommended Practices No. 1 – Standards for Aerodrome Bird/Wildlife Control.

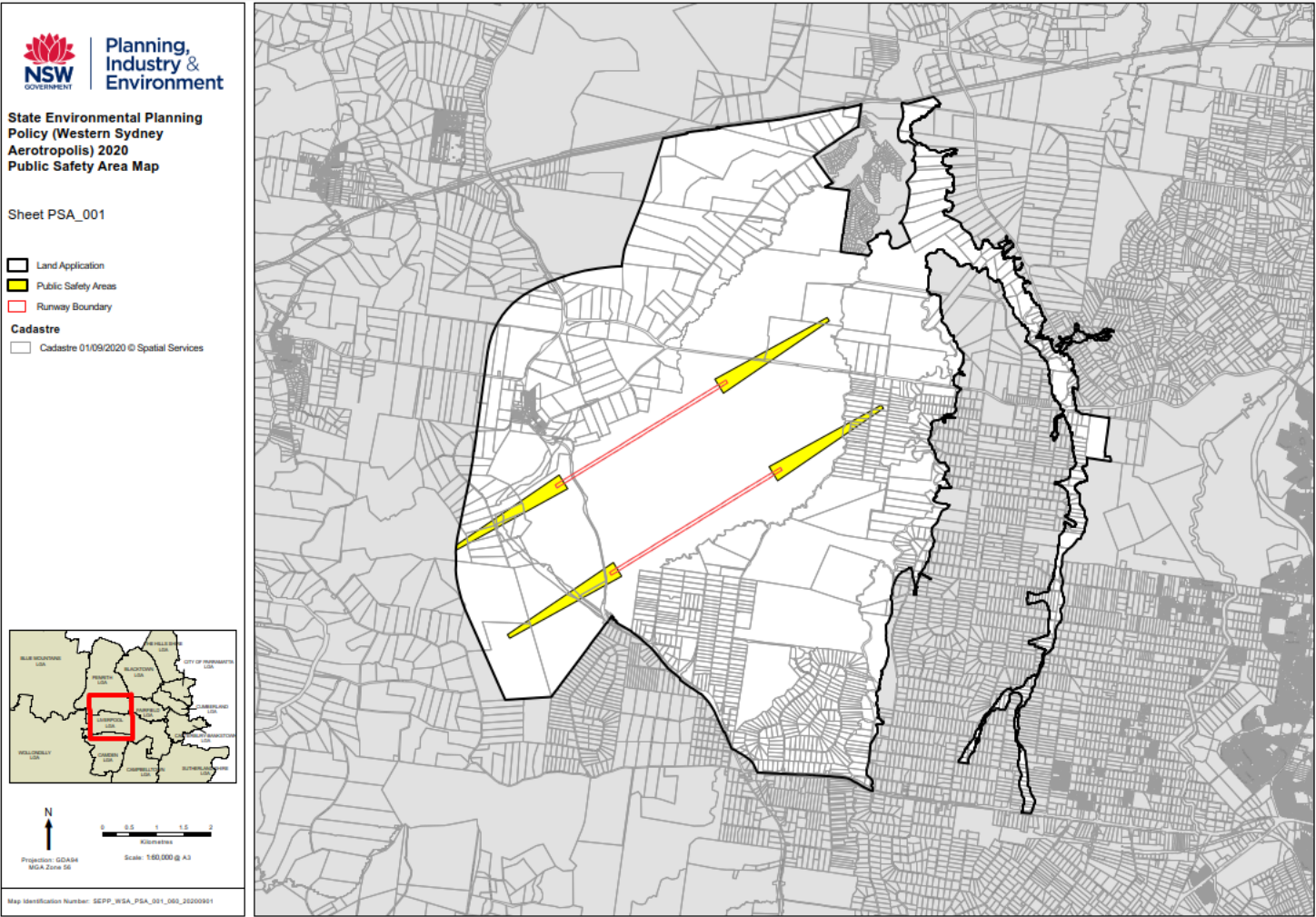
The project would be designed to avoid pilot distraction and minimise the risk of headlight glare from metro trains where on surface rail alignment. This would include providing glare screens in those locations where there creates an unacceptable risk of pilot distraction.

Further design development for the project would continue to consider and respond to other requirements relating to airport operations outlined in the NASF, including issues such as plume rise from the project's tunnel and portal ventilation systems as well as windblown dust.



Source: State Environmental Planning Policy (Western Sydney Aerotropolis) 2020

**Figure 23-2      Obstacle Limitation Surface Map – Western Sydney International**



Source: State Environmental Planning Policy (Western Sydney Aerotropolis) 2020

Figure 23-3 Public Safety Area Map – Western Sydney International

## **Operation of traction substations and electrical wiring**

### *Potential risks*

The project includes the augmentation of existing power supplies, including new traction substations, feeders and overhead wiring. Electro-magnetic fields associated with electrical equipment, including traction substations and overhead wiring, may result in adverse health effects to the community. A precautionary approach to managing these electro-magnetic fields and potential impacts would be taken as results of research on these impacts are inconclusive.

### *How potential risks and impacts would be managed*

The design and operation of the project's power supply would be undertaken in accordance with standard industry guidelines and codes of practice, such that conductive and semi-conductive materials effectively shield electrical fields. With regard to magnetic fields, the separation distance would be maximised between substations and public areas to minimise the potential to alter electro-magnetic field strength within the surrounding area. The project would be designed to comply with appropriate Australian and international standards to minimise the risk associated with electro-magnetic field exposure. Electric and magnetic fields are therefore not expected to pose a significant risk to public safety.

## **Train or station fire**

### *Potential risks*

During operation, a fire within metro train carriages or stations may result from flammables catching fire, incidents of arson or terrorism. This may result in injury and/or smoke inhalation for customers, and would result in emergency evacuation and/or a halt in services.

### *How potential risks and impacts would be managed*

Trains, tunnel and station design would be compliant with National Fire Protection Association (NFPA) guidelines and other relevant Australian fire codes and standards. Station sites would include fire stairs to allow for customer evacuation and emergency services access. Tunnels would provide space for fire and life safety systems. The stabling and maintenance facility would include fire control systems including the provision of fire hydrants, hoses and other firefighting equipment within the facility.

A tunnel ventilation system would be provided for underground stations and tunnelled sections of the alignment to allow for a range of ventilation requirements including station ventilation and ventilation for fire and life safety and operational scenarios (such as heat build-up). Tunnel ventilation facilities are proposed at the Orchard Hills and Western Sydney International tunnel portal and at the Claremont Meadows and Bringelly services facilities.

The ventilation systems for the project would also provide ventilation in the unlikely event of fire to ensure suitable conditions in the tunnel for safe egress of customers and safe access for emergency services personnel. In the event of fire, smoke-laden air would be discharged to the atmosphere via ventilation outlets at the stations, the service facilities and the tunnel ventilation facilities at the tunnel portals.

Separate mechanical ventilation systems would also be provided at the proposed underground stations for heat removal and to provide fresh air. Full height platform screen doors at stations would assist in controlling underground station temperatures by physically separating the tunnel and station environments. For further detail about the tunnel ventilation systems for the project see Section 7.5.3.

## **Damage or rupture to Warragamba to Prospect Water Supply Pipelines**

The project crosses above the pipelines on a viaduct structure and has the potential to damage or rupture the pipelines during operation, for example, as a result of train derailment.

### *How potential risks and impacts would be managed*

The railway has been designed to have sufficient clearance over the pipelines to minimise the risk of damage or rupture of the pipeline, in accordance with the Guidelines for Development Adjacent to the Upper Canal and Warragamba Pipelines.

The track alignment is relatively straight on approach to the pipelines, as well as where the viaduct track crosses above the pipelines. Safety barriers would be installed on the viaduct to prevent impacts associated with derailment. In addition, regular track inspections and maintenance would be carried out.

Unauthorised access to any areas outside the proposed stations (e.g. into the Warragamba pipelines corridor) would be prohibited and enforced by fencing and the trackside intrusion detection system. Maintenance access for WaterNSW and its contractors would be maintained for the Warragamba pipelines corridor.

Additional chapters which contain an assessment and mitigation measures for other potential risks to the pipelines during operation include:

- Chapter 10 (Noise and vibration), specifically for measures to avoid vibration impacts to the Warragamba pipelines
- Chapter 14 (Flooding, hydrology and water quality), specifically for an assessment of, and measures proposed, to avoid surface water flows across the corridor.

Sydney Metro would continue to develop the design of the project to minimise risks in consultation with WaterNSW, including ensuring the project would not compromise future WaterNSW proposals.

### **Other public safety risks**

#### *Potential risks*

During operation of the project, there would be other potential public safety risks, including train strike due to trespass, and safety or crime incidents at stations. Unauthorised access to the rail corridor has the potential to result in serious injury or fatality.

#### *How potential risks and impacts would be avoided*

In general, potential public safety impacts would be avoided by:

- managing operations in accordance with relevant legislative and policy requirements, including those listed in Section 23.2.1
- measures to prevent public access to the rail corridor including security fencing along both sides of the rail corridor, as described in Section 7.6.5, and a trackside intruder detection system, consisting of non-mechanical protection measures to supplement the fencing (including closed circuit television)
- more generally, designing and operating the project to minimise risks to health and safety, including other features described in Chapter 7 (Project description – operation)
- implementing the management and mitigation measures described in Section 23.5.

A key metro characteristic is to provide a system that is inherently safe for customers on trains, at stations, and at the interface with the public domain. The safety of passengers and the general public has been, and would continue to be, a key consideration during the design process. The following metro features would contribute to the safety and security of customers:

- customer service assistants at every station and moving through the network during the day and night
- station and train design that allow for good line of sight to enable passive and active surveillance
- stations and surrounding areas that are designed to be highly visible, active spaces with good lighting and amenity
- ensuring customers can see all the way along the train and move easily between carriages, including wide, open walkways between carriages
- level access between the platform and train and reduced gaps between the platform and the train



- providing platform screen doors at stations, creating a physical barrier which keeps people and objects separated from the edge of the platform and operating tracks, improving customer safety and allowing trains to get in and out of stations faster.

Other station safety features include CCTV cameras linked to the operations control centre, emergency help points, passenger information signage.

#### **23.4.2 On-airport**

Potential hazards and risks identified for the project during operation on-airport would be as per the off-airport hazards and risks identified in Section 23.4.1. The following sections provide additional assessment of on-airport specific hazards and risks.

The ongoing development of Western Sydney International may introduce other hazards and risks which have the potential to impact on the operation of the project, or the project may impact on those developments. These potential risks, such as the introduction of pipelines for the conveyance of aviation fuel or development above stations, would be assessed in the relevant planning approvals for those developments.

#### **Storage and transport of dangerous goods and hazardous substances**

##### *Potential risks*

The main risks likely to be encountered during the operation of the on-airport project components would be the storage, use and transport of chemicals, fuels and materials including sodium hydroxide, poly-aluminium chloride and polymer.

##### *How potential risks and impacts would be managed*

It is proposed that the NSW and Australian guidelines for storage and transport identified in Section 23.2.2 would be adopted for the on-airport components of the project (including Applying SEPP 33). Transport and storage methods would be confirmed during design development but would be designed in accordance with relevant guidelines outlined in HR6 (see Section 23.5.1), in order to ensure the hazardous materials would not pose a significant off-site risk.

#### **Airspace obstructions and safety**

The Airports Act and the Airspace Regulations enable the protection of airspace at and around regulated airports in Australia. The Airspace Regulations define the 'prescribed airspace' for airports as the airspace above any part of either an OLS or PANS-OPS, or any other airspace declared to be prescribed for the airport under the Airspace Regulations.

Approvals under Part 12 of the Airports Act relate to intrusion into prescribed airspace by physical structures or other impacts including from lighting, smoke and emissions. The section of the project south of Airport Business Park Station is proposed to be in-tunnel, which helps minimise the risk of airspace obstructions. The project would not obstruct protected airspace and would therefore not require separate approvals. The design development of the project would be designed to comply with OLS requirements. The OLS area for Western Sydney International is shown in Figure 23-2.

As discussed in Section 23.4.1, PSAs are designated areas of land at the end of an airport runway within which development may be restricted to control the number of people in the area. The Western Sydney Aerotropolis Plan has adopted a PSA based on the UK Public Safety Area model. The PSA is illustrated in Figure 23-3. The project crosses through the PSA for Runway 1 for around 400 metres.

Further design development for the project would continue to consider and respond to other requirements relating to airport operations outlined in the NASF.

## **Bushfire risks**

### *Potential risks*

Operation of the project has the potential to provide sources of ignition, including electrical cabling. Under adverse winds, these sources of ignition could allow a fire to escape off-site. The project is located in tunnel between around 400 metres southwest of the Airport Business Park Station and the southeast boundary of Western Sydney International, which mitigates bushfire risks in these areas.

### *How potential risks would be managed*

A Bushfire Management Plan would be prepared and implemented to manage current bushfire risk and identify response actions during operation of the project, including on-airport components of the project. The Plan would be prepared in consultation with the NSW Rural Fire Service and Western Sydney Airport. For project areas within Western Sydney International, the Plan would be prepared having regard to the existing Western Sydney Airport Site at Badgerys Creek Bushfire Risk Management Plan.

## **Train or station fire**

### *Potential risks*

During operation, a fire within metro train carriages or stations may result from flammables catching fire, incidents of arson or terrorism. This may result in injury and/or smoke inhalation for customers, and would result in emergency evacuation and/or a halt in services.

### *How potential risks and impacts would be managed*

Trains, tunnel and station design would be compliant with NFPA guidelines and other relevant Australian fire codes and standards. Station sites would include fire stairs to allow for customer evacuation and emergency services access. Tunnels would provide space for fire and life safety systems.

The ventilations systems for the project, including for underground stations and tunnelled sections of the alignment, would be provided as described in Section 7.5.3 and Section 23.4.1.

## **23.5 Proposed management and mitigation measures**

Environmental management for the project would be undertaken through an environmental management approach as detailed in Chapter 25 (Environmental management and mitigation). The construction and operational environmental management frameworks are discussed in Section 25.2 and 25.3 respectively.

Under these broad frameworks, mitigation and management measures would be applied during construction and operation to mitigate potential identified impacts (see Section 23.5.1). There are no specific performance outcomes for hazard and risk for the project.

### **23.5.1 Mitigation measures**

A Construction Environmental Management Framework (CEMF) (Appendix F) describes the approach to environmental management, monitoring and reporting during construction. It lists the requirements to be addressed by the construction contractor in developing the Construction Environmental Management Plans (CEMP), sub-plans, and other supporting documentation for each specific environmental aspect.

Mitigation measures that would be implemented under the provisions of the CEMF to address potential hazard and risk impacts are listed in Table 23-1.

Table 23-1 Hazard and risk mitigation measures

Ref	Mitigation measures	Applicable location(s)
<b>Construction</b>		
HR1	All hazardous substances that may be required for construction would be stored and managed in accordance with the <i>Storage and Handling of Dangerous Goods Code of Practice</i> (WorkCover NSW, 2005), the <i>Hazardous and Offensive Development Application Guidelines: Applying SEPP 33</i> (Department of Planning, Industry and Environment, 2011) the <i>Work Health and Safety Act 2011</i> (Commonwealth and NSW) and the requirements of the <i>Environmentally Hazardous Chemicals Act 1985</i> (NSW)	All
HR2	A Bushfire Management Plan would be prepared and implemented to manage current bushfire risk and identify response actions during construction of the project. The Plan would be prepared in consultation with the NSW Rural Fire Service and Western Sydney Airport. For project areas within Western Sydney International the Plan would be prepared having regard to the existing <i>Western Sydney Airport Site at Badgerys Creek Bushfire Risk Management Plan</i> (Western Sydney Airport Corporation, 2019)	All
HR3	A hazardous materials analysis would be carried out prior to stripping and demolition of structures and buildings which are suspected of containing hazardous materials (particularly asbestos)  Hazardous materials and special waste (such as asbestos) would be removed and disposed of in accordance with the relevant legislation, codes of practice and Australian Standards (including the Work Health and Safety and Regulation 2011 (NSW))	All
HR4	Construction planning and approaches to minimise risks of damage or rupture of the Warragamba to Prospect Water Supply Pipelines would be developed in consultation with WaterNSW, and in accordance with the <i>Guidelines for Development Adjacent to the Upper Canal and Warragamba Pipelines</i>	Off-airport
<b>Operation</b>		
HR5	All hazardous substances that may be required for operation would be stored and managed in accordance with the <i>Storage and Handling of Dangerous Goods Code of Practice</i> (WorkCover NSW, 2005), the <i>Hazardous and Offensive Development Application Guidelines: Applying SEPP 33</i> (Department of Planning, Industry and Environment, 2011).the <i>Work Health and Safety Act 2011</i> (Commonwealth and NSW) and the requirements of the <i>Environmentally Hazardous Chemicals Act 1985</i> (NSW)	All

Ref	Mitigation measures	Applicable location(s)
HR6	A Bushfire Management Plan would be prepared and implemented to manage current bushfire risk and identify response actions during operation of the project. The Plan would be prepared in consultation with the NSW Rural Fire Service and Western Sydney Airport. For project areas within Western Sydney International the Plan would be prepared having regard to the existing <i>Western Sydney Airport Site at Badgerys Creek Bushfire Risk Management Plan</i> (Western Sydney Airport Corporation, 2019)	All
HR7	The design of the project would aim to minimise risks of damage or rupture of the Warragamba to Prospect Water Supply Pipelines in consultation with WaterNSW, and in accordance with the <i>Guidelines for Development Adjacent to the Upper Canal and Warragamba Pipelines</i>	Off-airport
HR8	The project would be designed to avoid pilot distraction and minimise the risk of headlight glare from metro trains where on surface rail alignment. This would include providing glare screens in those locations where the project creates an unacceptable risk of pilot distraction	All

### 23.5.2 Consideration of the interaction between measures

Mitigation measures in other chapters that are relevant to the management of potential land use and property impacts include:

- Chapter 10 (Noise and vibration), specifically measures which address vibration impacts and the potential for structural damage from vibration
- Chapter 14 (Flooding, hydrology and water quality), specifically measures which address flooding risks during construction and operation of the project
- Chapter 15 (Groundwater and geology), specifically measures which address potential settlement impacts, including on structures
- Chapter 16 (Soils and contamination), specifically measures which address potential contamination impacts from existing sources and from the project, as well as the management of contaminated spoil
- Chapter 17 (Sustainability, climate change and greenhouse gas), specifically measures which address climate change risks such as extreme heat.