26 Hazard and risk

Environmental hazards resulting from the construction and operation of the project, and the identification of measures to avoid, mitigate or manage these risks, are addressed throughout the environmental impact statement (EIS).

Hazards arising from incidents during project construction and operation could pose to a risk to the surrounding community or the environment. Potential risks and appropriate management measures are discussed below.

26.1 Assessment of potential impacts

26.1.1 Construction

The following hazards and risks may be associated with the project during construction:

- Potential hazards resulting from the accidental release or improper handling and storage of dangerous goods and hazardous substances within construction compounds
- Potential hazards resulting from the accidental release of dangerous goods or hazardous substances from vehicles transporting those materials to and from construction compounds in the event of a crash
- Workplace and public health and safety hazards, such as dangers to construction workers, road users and the general public
- Potential hazards to road users and the general public relating to:
  - Potential rupture or interference with underground services
  - Bushfires
  - Aviation hazards.

Storage and handling of dangerous goods and hazardous substances

The storage, handling and use of dangerous goods and hazardous substances would be undertaken in accordance with the *Work Health and Safety Act 2011* (WHS Act), the *Storage and Handling of Dangerous Goods Code of Practice* (WorkCover NSW, 2005) and relevant Australian Standards.

The types and estimated quantities of dangerous goods and hazardous substances that would be stored and used within the construction compounds are outlined in **Table 26-1**. The location and purpose of each construction compound are detailed in **Chapter 6** (Construction work). Minor quantities of other materials may also be used at the construction compounds from time to time.

State Environmental Planning Policy No. 33 – Hazardous and Offensive Development (SEPP 33) does not apply to the project (refer to **Chapter 2** (Assessment process)). However, the principles of SEPP 33 have been followed to consider potential hazards associated with the project.

The thresholds specified in *Hazardous and Offensive Development Application Guidelines: Applying SEPP 33* (Applying SEPP 33) (Department of Planning, 2011) have been applied to the inventories of dangerous goods to be stored at each construction compound. These screening thresholds represent the level at which dangerous goods may present a credible off-site consequence that requires a further, more detailed assessment of risks. Application of the screening thresholds specified in Applying SEPP33 is included in **Table 26-1**.

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Table 26-1 Indicative dangerous goods and hazardous substances used onsite during the construction period (quantities are indicative only)

Material and Australian Dangerous Goods (DG) Code class	Kingsgrove North (C1)	Commercial Road (C3)	Bexley Road North (C4)	Bexley Road South (C5)	Bexley Road East (C6)	Arncliffe (C7)	Canal Road (C8)	Campbell Road (C9)	Landfill closure (C10)	Burrows Road (C11)	Burrows Road bridge (C12)	Gardeners Road bridge (C13)	Sydney Park (C14)	Assessment against Applying SEPP 33 inventory thresholds
Acetylene (litres) DG class 2.1	1040	1000	1000	1000	1000	1000	1040	40	-	40	40	40	40	Individual cylinders containing acetylene would not trigger the Applying SEPP 33 thresholds (100 kilograms). Maximum stored inventories (1,040 litres) would also be located more than 50 metres away from the nearest construction compound boundary and would also not trigger the Applying SEPP 33 thresholds if considered in aggregate.
Ammonium nitrate emulsion DG class 5.1	4000L for the whole tunnel.													Ammonium nitrate would not trigger the Applying SEPP 33 thresholds (five tonnes) if considered as individual containers or in aggregate.
Concrete bonding agent base (litres) DG class N/A	20	-	-	-	-	-	20	20	-	20	20	20	20	Concrete bonding agent bases are not dangerous goods and therefore do not trigger the Applying SEPP 33 thresholds.

Material and Australian Dangerous Goods (DG) Code class	Kingsgrove North (C1)	Commercial Road (C3)	Bexley Road North (C4)	Bexley Road South (C5)	Bexley Road East (C6)	Arncliffe (C7)	Canal Road (C8)	Campbell Road (C9)	Landfill closure (C10)	Burrows Road (C11)	Burrows Road bridge (C12)	Gardeners Road bridge (C13)	Sydney Park (C14)	Assessment against Applying SEPP 33 inventory thresholds
Concrete bonding agent hardener (litres) DG class 8	20	-	-	-	-	-	20	20		20	20	20	20	Concrete bonding agent hardener would not trigger the Applying SEPP 33 thresholds (25 tonnes) if considered as individual containers or in aggregate.
Concrete surface retarder (litres) DG class 3 PGIII	200	-	-	-	-	-	200	200	-	200	200	200	200	Concrete surface retarder would not trigger the Applying SEPP 33 thresholds (five tonnes) if considered as individual containers or in aggregate.
Construction grout (kilograms) DG class N/A	60	-	-	-	-	-	60	60	-	60	60	60	60	Construction grout is not a dangerous good and therefore does not trigger the Applying SEPP 33 thresholds.
Curing compound (litres) DG class N/A	1000	600	600	600	600	600	1000	400	-	400	400	400	400	Curing compounds are not dangerous goods and therefore do not trigger the Applying SEPP 33 thresholds.

Material and Australian Dangerous Goods (DG) Code class	Kingsgrove North (C1)	Commercial Road (C3)	Bexley Road North (C4)	Bexley Road South (C5)	Bexley Road East (C6)	Arncliffe (C7)	Canal Road (C8)	Campbell Road (C9)	Landfill closure (C10)	Burrows Road (C11)	Burrows Road bridge (C12)	Gardeners Road bridge (C13)	Sydney Park (C14)	Assessment against Applying SEPP 33 inventory thresholds
Diesel DG class C1 PGIII	60,200	60,000	60,000	60,000	60,000	60,000	60,200	200	200	200	200	200	200	Diesel would not be stored with Class 3 materials and would therefore not be subject to the Applying SEPP 33 thresholds.
Epoxy paste part A (litres) DG class 3 PGIII	20	-	-	-	-	-	20	20	-	20	20	20	20	Epoxies would not trigger the Applying SEPP 33 thresholds (five tonnes) if considered as individual containers or in aggregate
Epoxy paste part B (litres) DG class 3 PGIII	20	-	-	-	-	-	20	20	-	20	20	20	20	Epoxies would not trigger the Applying SEPP 33 thresholds (five tonnes) if considered as individual containers or in aggregate.
Form oil (litres) DG class C2	600	400	400	400	400	400	600	200		200	200	200	200	Form oil would not be stored with Class 3 materials and would therefore not be subject to the Applying SEPP 33 thresholds.
Grease (kilograms) DG class C2	10	-	-	-	-	-	10	10	10	10	10	10	10	Grease would not be stored with Class 3 materials and would therefore not be subject to the Applying SEPP 33 thresholds.
Hydraulic oil (litres) DG class C2	2100	2000	2000	2000	2000	2000	2100	100	100	100	100	100	100	Hydraulic oil would not be stored with Class 3 materials and would therefore not be subject to the Applying SEPP 33 thresholds.

Material and Australian Dangerous Goods (DG) Code class	Kingsgrove North (C1)	Commercial Road (C3)	Bexley Road North (C4)	Bexley Road South (C5)	Bexley Road East (C6)	Arncliffe (C7)	Canal Road (C8)	Campbell Road (C9)	Landfill closure (C10)	Burrows Road (C11)	Burrows Road bridge (C12)	Gardeners Road bridge (C13)	Sydney Park (C14)	Assessment against Applying SEPP 33 inventory thresholds
Injectable mortar (kilograms) DG class N/A	10	-	-	-	-	-	10	10	-	10	10	10	10	Injectable mortar is not a dangerous good and therefore does not trigger the Applying SEPP 33 thresholds.
Joint sealant (kilograms) DG class N/A	12	-	-	-	-	-	12	12	-	12	12	12	12	Joint sealant is not a dangerous good and therefore does not trigger the Applying SEPP 33 thresholds.
Line marking aerosol (kilograms) DG class 2.1	18	-	-	-	-	-	18	18	-	18	18	18	18	Individual cylinders containing line marking aerosol would not trigger the Applying SEPP 33 thresholds (100 kilograms).
Liquid nails (kilograms) DG class 3 PGII	7	-	-	-	-	-	7	7	-	7	7	7	7	Liquid nails would not trigger the Applying SEPP 33 thresholds (five tonnes) if considered as individual containers or in aggregate.
Oxygen (litres) DG class 2.2	1100	1000	1000	1000	1000	1000	1100	100	-	100	100	100	100	Industrial grade oxygen is a Class 2.2 dangerous good and is therefore not subject to the Applying SEPP 33 thresholds.

Material and Australian Dangerous Goods (DG) Code class	Kingsgrove North (C1)	Commercial Road (C3)	Bexley Road North (C4)	Bexley Road South (C5)	Bexley Road East (C6)	Arncliffe (C7)	Canal Road (C8)	Campbell Road (C9)	Landfill closure (C10)	Burrows Road (C11)	Burrows Road bridge (C12)	Gardeners Road bridge (C13)	Sydney Park (C14)	Assessment against Applying SEPP 33 inventory thresholds
Polyurethane foam (kilograms) DG class 2.1	15	-	-	-	-	-	15	15	-	15	15	15	15	Individual cylinders containing polyurethane foam would not trigger the Applying SEPP 33 thresholds (100 kilograms) if considered as individual containers or in aggregate.
Sodium hydroxide (litres) DG class 8 PGII	3000	3000	3000	3000	3000	3000	3000	-	-	-	-	-	-	Sodium hydroxide would not trigger the Applying SEPP 33 thresholds (25 tonnes) if considered as individual containers or in aggregate.
Sulfuric acid (litres) DG class 8 PGII	3000	3000	3000	3000	3000	3000	3000	-	-	-	-	-	-	Sulfuric acid would not trigger the Applying SEPP 33 thresholds (25 tonnes) if considered as individual containers or in aggregate.
Unleaded Petrol (litres) DG class 3 PGII	600	500	500	500	500	500	600	100	100	100	100	100	100	Epoxies would not trigger the Applying SEPP 33 thresholds (five tonnes) if considered as individual containers or in aggregate.

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Table 26-1 demonstrates that the dangerous goods ad hazardous substances proposed to be stored at each construction compound would not exceed the Applying SEPP 33 inventory thresholds. This indicates that the proposed storage of dangerous goods and hazardous substances at construction compounds would not pose a credible off-site consequence, in the unlikely event of an incident at the proposed construction compound locations.

In each construction compound:

- Liquid dangerous goods and hazardous chemicals would be stored within a bunded storage container or spill tray
- Gases would be secured and stored in a storage cage in a well-ventilated area
- Storage areas would be located away from natural or built drainage lines to minimise the likelihood of pollutants entering adjacent watercourses in the unlikely event of a spill or leak escaping the bunded area
- Self bunded fuel storage areas would be located within or adjacent to acoustic sheds.

A register and inventory of the dangerous goods and hazardous substances to be stored at each construction compound would be kept as part of the Incident Response Management Plan for the project. Material Safety Data Sheets would also be provided for each relevant material.

Implementation of environmental management measures for the storage and handling of dangerous goods and hazardous substances, as detailed in **Table 26-6**, would reduce the risk to the environment, construction personnel and the public.

Transport of dangerous goods and hazardous substances

Transportation of dangerous goods would not exceed the Applying SEPP 33 thresholds and would be undertaken in accordance with supplier's instructions.

Table 26-2 outlines the dangerous goods and hazardous substances that would be transported to construction compounds. Potential hazards and risks associated with the transportation of dangerous goods and hazardous substances have been considered by comparing the type, quantity and frequency of dangerous goods and hazardous substances with the thresholds presented in Applying SEPP 33.

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Table 26-2 Dangerous goods and hazardous substances that are expected to be transported to construction compounds

Material and Australian Dangerous Goods Code class	Transport quantity and frequency	Construction compound destination	Assessment against Applying SEPP 33 inventory thresholds
Acetylene DG class 2.1	40 litres per month	Kingsgrove North (C1), Commercial Road (C3), Bexley Road North (C4), Bexley Road South (C5), Bexley Road East (C6), Arncliffe (C7), Canal Road (C8), Campbell Road (C9), Burrows Road (C11), Burrows Road bridge (C12), Gardeners Road bridge (C13), Sydney Park (C14)	Industrial grade acetylene would not trigger the Applying SEPP 33 transportation thresholds for minimum transport load or transport frequency of two tonnes, more than 30 times per week.
Ammonium nitrate emulsion DG class 5.1	4000 litres once during the project	Kingsgrove North (C1), Commercial Road (C3), Bexley Road North (C4), Bexley Road South (C5), Bexley Road East (C6), Arncliffe (C7), Canal Road (C8)	Ammonium nitrate emulsion would trigger the Applying SEPP 33 transportation thresholds for minimum transport load of two tonnes. However it would not trigger the threshold for transport frequency (more than 30 times per week) and thus is unlikely to be significant.
Concrete bonding agent base DG class N/A	20 litres per month	Kingsgrove North (C1), Canal Road (C8), Campbell Road (C9), Burrows Road (C11), Burrows Road bridge (C12), Gardeners Road bridge (C13), Sydney Park (C14)	Concrete bonding agent base is not subject to the Applying SEPP 33 transportation thresholds.
Concrete bonding agent hardener DG class 8	20 litres per month	Kingsgrove North (C1), Canal Road (C8), Campbell Road (C9), Burrows Road (C11), Burrows Road bridge (C12), Gardeners Road bridge (C13), Sydney Park (C14)	Concrete bonding agent hardener would not trigger the Applying SEPP 33 transportation thresholds for minimum transport load or transport frequency of two tonnes, more than 30 times per week.
Concrete surface retarder DG class 3 PGIII	200 litres per month	Kingsgrove North (C1), Canal Road (C8), Campbell Road (C9), Burrows Road (C11), Burrows Road bridge (C12), Gardeners Road bridge (C13), Sydney Park (C14)	Concrete surface retarder would not trigger the Applying SEPP 33 transportation thresholds for minimum transport load or transport frequency of 10 tonnes, more than 60 times per week.
Construction grout DG class N/A	60 kilograms per month	Kingsgrove North (C1), Canal Road (C8), Campbell Road (C9), Burrows Road (C11), Burrows Road bridge (C12), Gardeners Road bridge (C13), Sydney Park (C14)	Construction grout is not subject to the Applying SEPP 33 transportation thresholds.

Material and Australian Dangerous Goods Code class	Transport quantity and frequency	Construction compound destination	Assessment against Applying SEPP 33 inventory thresholds
Curing compound DG class N/A	200 litres per month	Kingsgrove North (C1), Commercial Road (C3), Bexley Road North (C4), Bexley Road South (C5), Bexley Road East (C6), Arncliffe (C7), Canal Road (C8), Campbell Road (C9), Burrows Road (C11), Burrows Road bridge (C12), Gardeners Road bridge (C13), Sydney Park (C14)	Curing compounds are not subject to the Applying SEPP 33 transportation thresholds.
Diesel DG class C1 PG III	1000 litres * per day	Kingsgrove North (C1), Commercial Road (C3), Bexley Road North (C4), Bexley Road South (C5), Bexley Road East (C6), Arncliffe (C7), Canal Road (C8), Landfill closure (C8) Campbell Road (C9), Burrows Road (C11), Burrows Road bridge (C12), Gardeners Road bridge (C13), Sydney Park (C14)	Diesel would not be transported with Class 3 dangerous goods. Therefore, it would not be subject to the Applying SEPP 33 transportation thresholds
Epoxy paste part A DG class 3 PGIII	20 litres per month	Kingsgrove North (C1), Canal Road (C8), Campbell Road (C9), Burrows Road (C11), Burrows Road bridge (C12), Gardeners Road bridge (C13), Sydney Park (C14)	Epoxies would not trigger the Applying SEPP 33 transportation thresholds for minimum transport load or transport frequency of 10 tonnes, more than 60 times per week.
Epoxy paste part B DG class 3 PGIII	20 litres per month	Kingsgrove North (C1), Canal Road (C8), Campbell Road (C9), Burrows Road (C11), Burrows Road bridge (C12), Gardeners Road bridge (C13), Sydney Park (C14)	Epoxies would not trigger the Applying SEPP 33 transportation thresholds for minimum transport load or transport frequency of 10 tonnes, more than 60 times per week.
Form oil DG class C2	200 litres per month	Kingsgrove North (C1), Commercial Road (C3), Bexley Road North (C4), Bexley Road South (C5), Bexley Road East (C6), Arncliffe (C7), Canal Road (C8), Campbell Road (C9), Burrows Road (C11), Burrows Road bridge (C12), Gardeners Road bridge (C13), Sydney Park (C14)	Form oil is not a dangerous good and would not be transported with Class 3 dangerous goods. Therefore, it would not be subject to the Applying SEPP 33 transportation thresholds.
Grease DG class C2	5 kilograms per month	Kingsgrove North (C1), Canal Road (C8), Campbell Road (C9), Landfill closure (C10), Burrows Road (C11), Burrows Road bridge (C12), Gardeners Road bridge (C13), Sydney Park (C14)	Grease is not a dangerous good and would not be transported with Class 3 dangerous goods. Therefore, it would not be subject to the Applying SEPP 33 transportation thresholds

Material and Australian Dangerous Goods Code class	Transport quantity and frequency	Construction compound destination	Assessment against Applying SEPP 33 inventory thresholds
Hydraulic oil DG class C2	100 litres per month	Kingsgrove North (C1), Commercial Road (C3), Bexley Road North (C4), Bexley Road South (C5), Bexley Road East (C6), Arncliffe (C7), Canal Road (C8), Landfill closure (C8) Campbell Road (C9), Burrows Road (C11), Burrows Road bridge (C12), Gardeners Road bridge (C13), Sydney Park (C14)	Hydraulic oil is not a dangerous good and would not be transported with Class 3 dangerous goods. Therefore, it would not be subject to the Applying SEPP 33 transportation thresholds.
Injectable mortar DG class N/A	10 kilograms per month	Kingsgrove North (C1), Canal Road (C8), Campbell Road (C9), Burrows Road (C11), Burrows Road bridge (C12), Gardeners Road bridge (C13), Sydney Park (C14)	Injectable mortar is not subject to the Applying SEPP 33 transportation thresholds.
Joint sealant DG class N/A	6 kilograms per month	Kingsgrove North (C1), Canal Road (C8), Campbell Road (C9), Burrows Road (C11), Burrows Road bridge (C12), Gardeners Road bridge (C13), Sydney Park (C14)	Joint sealant is not subject to the Applying SEPP 33 transportation thresholds.
Line marking aerosol DG class 2.1	18 kilograms per month	Kingsgrove North (C1), Canal Road (C8), Campbell Road (C9), Burrows Road (C11), Burrows Road bridge (C12), Gardeners Road bridge (C13), Sydney Park (C14)	Line marking aerosol would not trigger the Applying SEPP 33 transportation threshold for minimum transport load or transport frequency of two tonnes, more than 30 times per week.
Liquid nails DG class 3 PGII	7 kilograms per month	Kingsgrove North (C1), Canal Road (C8), Campbell Road (C9), Burrows Road (C11), Burrows Road bridge (C12), Gardeners Road bridge (C13), Sydney Park (C14)	Liquid nails would not trigger the Applying SEPP 33 transportation threshold for minimum transport load or transport frequency of three tonnes, more than 45 times per week.
Oxygen DG class 2.2	200 litres per month	Kingsgrove North (C1), Commercial Road (C3), Bexley Road North (C4), Bexley Road South (C5), Bexley Road East (C6), Arncliffe (C7), Canal Road (C8), Campbell Road (C9), Burrows Road (C11), Burrows Road bridge (C12), Gardeners Road bridge (C13), Sydney Park (C14)	Industrial grade oxygen is not subject to the Applying SEPP 33 transportation thresholds.

Material and Australian Dangerous Goods Code class	Transport quantity and frequency	Construction compound destination	Assessment against Applying SEPP 33 inventory thresholds
Polyurethane foam DG class 2.1	8 kilograms per month	Kingsgrove North (C1), Canal Road (C8), Campbell Road (C9), Burrows Road (C11), Burrows Road bridge (C12), Gardeners Road bridge (C13), Sydney Park (C14)	Polyurethane foam would not trigger the Applying SEPP 33 transportation threshold for minimum transport load or transport frequency of two tonnes, more than 30 times per week.
Sodium hydroxide DG class 8 PGII	3000 litres per month	Kingsgrove North (C1), Commercial Road (C3), Bexley Road North (C4), Bexley Road South (C5), Bexley Road East (C6), Arncliffe (C7), Canal Road (C8)	Sodium hydroxide would not trigger the Applying SEPP 33 transportation thresholds of 25 tonnes as individual containers or in aggregate.
Sulfuric acid DG class 8 PGII	3000 litres per month	Kingsgrove North (C1), Commercial Road (C3), Bexley Road North (C4), Bexley Road South (C5), Bexley Road East (C6), Arncliffe (C7), Canal Road (C8)	Sulfuric acid would not trigger the Applying SEPP 33 transportation thresholds of 25 tonnes as individual containers or in aggregate.
Unleaded petrol DG class 3 PGII	200 litres * per week	Kingsgrove North (C1), Commercial Road (C3), Bexley Road North (C4), Bexley Road South (C5), Bexley Road East (C6), Arncliffe (C7), Canal Road (C8), Landfill closure (C8) Campbell Road (C9), Burrows Road (C11), Burrows Road bridge (C12), Gardeners Road bridge (C13), Sydney Park (C14)	Unleaded petrol would not trigger the Applying SEPP 33 transportation thresholds for minimum transport load or transport frequency of three tonnes, more than 45 times per week.

1 Quantities are indicative only

* Note: for some construction compounds the quantity of diesel and unleaded petrol delivered to site would greater than the quantity stored within the compound at any time because the delivery volume takes into the account fuel which is brought to the compound by mini-tanker and used to directly refuel plant. As this fuel is “in use” in the plant it is not classified as “stored”

Construction workplace hazards

Factors contributing to construction workplace hazards in tunnelling projects include uncertainty in the nature and variability of ground conditions, the restricted tunnel environment, difficulty in communications and the use of compressed air.

Hazards include:

- Partial or complete tunnel collapse with potential associated surface impacts
- Tunnel fires or explosions
- Rock falls at cuttings
- Exposure to airborne pollutants such as asbestos fibres during demolition work and dust during tunnelling.

Design of the main alignment tunnels has taken into account a number of parameters including separation of the tunnels, cross passage locations and connectivity, maximum spans at merges and diverges, depth of cover to minimise settlement risk, and areas to avoid due to potentially poor tunnelling conditions. The majority of the tunnel alignment would be constructed at depths between 15 metres and 60 metres, within Hawkesbury Sandstone. The geology of Hawkesbury Sandstone is an excellent tunnelling medium due to its high strength and infrequent defects.

During tunnelling, a 'permit to tunnel' system would be developed and implemented. As part of this system, geological conditions at the tunnel face would be confirmed against the expected geological conditions and the project design prior to advancing tunnel excavation. This would ensure that the planned tunnel support proposed to be implemented is appropriate for the encountered geological conditions. The requirements of the WorkCover Code of Practice for Tunnels would be met to ensure that no persons would work under unsupported ground without an adequate overhead protection structure. The structural integrity of the tunnel would be assured during construction through the implementation of appropriate construction methodology for the tunnelling conditions and ongoing tunnel support by way of rockbolts and / or shotcrete lining. In certain locations, a passive support system comprising a thick temporary support in combination with a permanent sprayed lining may also be adopted.

Combustible materials within a tunnel have the potential to cause tunnel fires and explosions. The rapid consumption of oxygen and production of noxious fumes and gases can make tunnel fires severe. Diesel equipment fire precautions, hot work procedures and electrical equipment procedures would be followed and adequate training would be provided to minimise risks associated with fire and explosion. Temporary construction compounds would be maintained in a tidy and orderly manner, with the aim of minimising potential fuel loads and isolating fuel sources from ignition sources.

Rock falls can occur during excavation of the portals if the portal breakthrough area is not secured before excavation. Rock falls have the potential to injure construction workers and cause damage to construction equipment. The interchange dive structures at the eastern and western portals have the potential to create rock fall hazards. This is because steep slope sites have the potential to pose slip, fall, and unsecured equipment hazards. The risk of rock fall would not be limited to the eastern and western portals.

Standard construction and mitigation measures would be applied to manage rock fall risk, including the use of appropriate personal protective equipment, frequent tunnel inspections, scaling, installation of properly secured ground support, safety fencing and overhead protection.

During construction, airborne pollutants have the potential to occur including dust and toxic gas. If this were to occur, it may result in oxygen deficient environments and health risks for construction workers. Dust generation in the tunnels would be minimised by wetting down the cutting face and the use of temporary fans and dry dust scrubbers. Standard ventilation, dust extraction and monitoring procedures would be carried out when appropriate.

Hazardous materials including asbestos may be encountered during demolition works and utility relocations. Microscopic asbestos fibres that become airborne can become a health risk if inhaled into the lungs. Areas that potentially include asbestos are described in **Chapter 17** (Contamination). The management of potential asbestos waste is described further in **Chapter 24** (Resource use and waste minimisation).

Gases within the tunnel such as carbon monoxide (CO), carbon dioxide (CO_2) and nitrogen dioxide (NO_2) have the potential to be a hazard to construction workers and would be properly monitored.

Road user and general public hazards

Services

All services near the project would be identified prior to the commencement of construction.

The potential rupture of underground services during excavation could pose a hazard in the form of electrocution, release of sewage from a wastewater main or fire if a gas main is impacted.

The risk associated with these hazards would be minimised before starting work by:

- Undertaking utility checks (such as dial before you dig)
- Consulting relevant service infrastructure providers
- Tagging and potholing identified services via markers
- Relocating and / or protecting utilities as required (ie temporary protection at surface level by placing steel plates over the service).

Consultation with service infrastructure providers would commence during the design phase of the project and continue during construction to mitigate the risk of unplanned and unexpected disturbance of utilities. The relocation of utilities may result in short term outages of some services to surrounding areas. Services that would be directly impacted and require protection and / or relocation as a result of the project are detailed in **Chapter 13** (Land use and property).

Bushfire

The project would not be located in or near bushfire prone land. Of the local government areas traversed by the project, only Hurstville local government area contains land mapped as being bushfire prone. However, mapping within the *Hurstville Local Environmental Plan 2012* does not identify bushfire prone land as being present within the project corridor. Other local government areas are highly urbanised and do not contain large areas of vegetation that are associated with bushfire risk. As such, bushfire risks to the project are considered to be minor.

Temporary construction compounds and construction infrastructure would be generally less sensitive to bushfire risks than operational facilities, given the temporary nature of the construction compounds and the absence of critical infrastructure within the compounds.

Notwithstanding, the low likelihood of bushfire events within the project corridor, measures to mitigate and manage bushfire risks would be developed and included as part of site-specific hazard and risk management measures within Construction Environmental Management Plan.

Temporary construction compounds would be maintained in a tidy and orderly manner to minimise potential fuel loads in the event that the compounds are affected by fire. Storage and management of dangerous goods and hazardous materials would occur in a safe, secure location consistent with the requirements of applicable Australian Standards.

Construction activities involving flammable materials and ignition sources (for example, welding) would be proactively managed to ensure that fire risks are effectively minimised. High risk construction activities, such as welding and metal work, would be subject to a risk assessment on total fire ban days and restricted or ceased as appropriate.

Aviation risks

The *Airports (Protection of Airspace) Regulations 1996* (Commonwealth) (Airspace Regulations) were established for the protection of airspace at and around regulated airports in Australia including Sydney Airport. The Airspace Regulations define the 'prescribed airspace' for Sydney Airport as the airspace above any part of either an obstacle limitation surface or procedures for air navigation services – aircraft operations surfaces for the airport.

Under the *Airports Act 1996* (Commonwealth), a 'controlled activity' in relation to a prescribed airspace must not be carried out or caused to be carried out without the approval of the Secretary of the Commonwealth Department of Infrastructure and Regional Development or is otherwise exempt under the Airspace Regulations. Controlled activities include (depending on the precise event or occurrence):

- The construction of buildings and structures that intrude into prescribed airspace
- Artificial light sources that exceed specified intensity levels
- Activities that result in air turbulence that exceed specified levels
- Activities that involve the emission of smoke, dust, other particulate matter, steam or other gas that exceed specified levels.

The obstacle limitation surfaces define the airspace to be protected for aircraft operating during the initial and final stages of flight, or manoeuvring in the vicinity of Sydney Airport. They have been established in accordance with International Civil Aviation Organisation specifications, as adopted by Australia's Civil Aviation Safety Authority. The construction activities would be carried out to ensure that equipment, such as cranes, and materials do not intrude into the obstacle limitation surfaces or the procedures for air navigation services – aircraft operations surfaces.

The Civil Aviation Safety Authority has been consulted during the development of the project design and would be consulted further prior to commencement of construction to ensure that the construction activities proposed for the Arncliffe surface works, St Peters interchange and local roads upgrades are undertaken in line with the *Airports (Protection of Airspace) Regulations 1996* (Cth) and *Airports Act 1996* (Commonwealth), in a manner that satisfies the requirements of the Civil Aviation Safety Authority.

The Civil Aviation Safety Authority, under the *Civil Aviation Regulations 1988*, also regulates ground lighting where it has the potential to impact airport operations (such as causing confusion or distraction from glare to pilots in the air). The *Sydney Airport Master Plan 2033* outlines the requirements for external lighting. Lighting during construction would adhere to the established guidelines on the location and permitted intensities of ground lights within a six kilometre radius of Sydney Airport.

26.1.2 Operation

During operation, the following potential hazards and risks may be associated with the project:

- Hazards resulting from the accidental release or improper handling and storage of dangerous goods and hazardous substances
- Potential hazards resulting from the accidental release of dangerous goods or hazardous substances from vehicles transporting those materials to and from motorway operations complexes in the event of a crash
- Crashes and incidents in the main alignment tunnels or on tunnel on and off-ramp
- Crashes and incidents on surface roads
- Risks from electric and magnetic fields from the project substations
- Potential risks from bushfires
- Potential aviation hazards.

Storage and handling of dangerous goods and hazardous substances

Dangerous goods and hazardous substances stored and used during operation of the project would be limited and may include coagulants, polymers, acid and bases (outlined in **Table 26-3**). Additional small quantities of other materials may be required onsite occasionally to support maintenance activities.

A comparison of the likely types and quantities of dangerous goods and hazardous substances to be stored onsite with thresholds in Applying SEPP 33 indicates that operational inventories would not be potentially hazardous.

Transport of dangerous goods and hazardous substances

Dangerous goods and hazardous substances that would be transported to the project during operation are outlined in **Table 26-4**. Additional small quantities of other materials may occasionally be required onsite to support maintenance activities. A comparison of the likely types and quantities of dangerous goods and hazardous materials to be transported with thresholds in Applying SEPP 33 indicates that the transport of operational inventories would not be potentially hazardous. In the event that thresholds are exceeded, transport frequency is likely to be well below the frequency threshold and as such, risks are unlikely to be significant.

Table 26-3 Indicative dangerous goods and hazardous substances stored onsite during operation

Material and Australian Dangerous Goods (DG) Code Class	Storage method	Assessment against Applying SEPP 33 inventory thresholds
Sodium Hydroxide, DG class 8 PGII	12,000 litres feed tank in an undercover bunded area	Sodium hydroxide would not trigger the Applying SEPP 33 thresholds of 25 tonnes if considered as individual containers or in aggregate.
Coagulant, DG class N/A	12,000 litres feed tank in an undercover bunded area	Coagulant is not a dangerous good and does not trigger the Applying SEPP 33 thresholds.
Polymers, DG class N/A	20 kilograms bags stored in a undercover container	Polymers are not a dangerous good and do not trigger the Applying SEPP 33 thresholds.
Diesel, DG class C1 PGIII	Bunded tanks	Diesel would not be stored with Class 3 materials and would therefore not be subject to the Applying SEPP 33 thresholds.
Acetylene, DG class 2.1	Size G cylinders	Individual cylinders containing acetylene would not trigger the Applying SEPP 33 thresholds of 100 kilogram. Maximum stored inventories would not trigger the Applying SEPP 33 thresholds if considered in aggregate.
Oxygen, DG class 2.2	Size G cylinders	Industrial grade oxygen is a Class 2.2 dangerous good and is not subject to the Applying SEPP 33 thresholds.
Grease, DG class C2	400g cartridge, 20 litre container stored undercover	Grease would not be stored with Class 3 materials and would not be subject to the Applying SEPP 33 thresholds.
Adhesives, DG class 3 PGIII	375 grams cartridge, 20 litre container	Adhesives would not trigger the Applying SEPP 33 thresholds of five tonnes if considered as individual containers or in aggregate.
Bitumen, DG class 9	15,000 litre tanker (brought onto site as required for days operation)	Bitumen is a Class 9 dangerous good and not subject to the Applying SEPP 33 thresholds.
Kerosene, DG class 3 PGIII	20 litre container stored undercover in bunded area	Kerosene would not trigger the Applying SEPP 33 thresholds of five tonnes if considered as individual containers or in aggregate.
Non shrink grout, DG class N/A	20 kilogram bags stored under cover	Non shrink grout is not a dangerous good
Release agent (Lanolin based), DG class N/A	20 litre drums stored undercover	Release agent (Lanolin based) is not a dangerous good and does not trigger the Applying SEPP 33 thresholds.
Line marking aerosol, DG class 2.1	375 millilitre aerosol container stored undercover	Line marking aerosol would not trigger the Applying SEPP 33 thresholds (100 kilograms).

Table 26-4 Dangerous good and hazardous substances transported during operation

Material and Australian Dangerous Goods Code Class	Transport frequency	Transport quantity	Assessment against Applying SEPP 33 inventory thresholds
Sodium Hydroxide, DG class 8 PGII	Six monthly	10,000 litres	Sodium hydroxide would not trigger the Applying SEPP 33 transportation thresholds (25 tonnes) as individual containers or in aggregate.
Coagulant, DG class N/A	Quarterly	10,000 litres	Coagulant is not a dangerous good and does not trigger the Applying SEPP 33 thresholds.
Polymers, DG class N/A	Quarterly	1000 kilograms	Polymers are not a dangerous good and do not trigger the Applying SEPP 33 thresholds.
Diesel, DG class C1 PGIII	As required	As required	Diesel would not be transported with Class 3 dangerous goods. It is not subject to the Applying SEPP 33 transportation thresholds
Acetylene, DG class 2.1	Weekly	50 cylinders	Industrial grade acetylene would not trigger the Applying SEPP 33 transportation thresholds for minimum transport load or transport frequency of two tonnes, more than 30 times per week.
Oxygen, DG class 2.2	Weekly	50 cylinders	Industrial grade oxygen is a Class 2.2 dangerous good and is not subject to the Applying SEPP 33 thresholds.
Grease, DG class C2	Monthly	50 cartridges (20 kilograms)	Grease is not a dangerous good and would not be transported with Class 3 dangerous goods. Therefore, it is not subject to the Applying SEPP 33 transportation thresholds
Adhesives, DG class 3 PGIII	Weekly	50 cartridges (19 kilograms)	Adhesives would not trigger the Applying SEPP 33 transportation thresholds for minimum transport load or transport frequency of 10 tonnes, more than 60 times per week.
Bitumen, DG class 9	Quarterly	15,000 litres	Bitumen would not trigger the Applying SEPP 33 transportation thresholds for minimum transport load or transport frequency of no limit, more than 60 times per week.
Kerosene, DG class 3 PGIII	Monthly	100 litres	Kerosene would not trigger the Applying SEPP 33 transportation thresholds for minimum transport load or transport frequency of 10 tonnes, more than 60 times per week.
Non shrink grout, DG class N/A	Monthly	2000 kilograms	No shrink grout is not a dangerous good and therefore does not trigger the Applying SEPP 33 thresholds

Material and Australian Dangerous Goods Code Class	Transport frequency	Transport quantity	Assessment against Applying SEPP 33 inventory thresholds
Release agent (Lanolin based), DG class N/A	Two monthly	200 litres	Release agent (Lanolin based) is not a dangerous good and therefore does not trigger the Applying SEPP 33 thresholds
Line marking aerosol, DG class 2.1	Quarterly	50 cans	Line marking aerosol would not trigger the Applying SEPP 33 thresholds for minimum transport load or transport frequency of two tonnes, more than 30 times per week.

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Incidents in the project tunnels

The project has been designed to provide for efficient, free flowing traffic with physical capacity to accommodate predicted traffic volumes. The preferred design has incorporated all feasible and reasonable design measures including those relating to geometry, pavement, lighting and signage, and is consistent with current Australian Standards, road design guidelines and industry best practice. In doing so, the design of the project has been developed to minimise the likelihood of incidents and crashes.

As with the operation of all roads, there is an inherent risk of vehicle collision in the project tunnels and on surface roads. Factors that contribute to the hazard of vehicle collisions within the operation of the project include:

- The design of the project
- The traffic types and volumes using the tunnels
- Driving conditions, including light conditions and weather
- Human factors, including compliance with road rules, attention to driving conditions and fatigue
- Vehicle failure and breakdown.

The design is equivalent to, or exceeds, the fire safety measures recommended by NFPA502 (American) and Permanent International Association of Road Congress (European) standards, the fire safety measures recommended by AS4825 (Australian) – Tunnel fire safety and Roads and Maritime (NSW) standards, and is consistent with recent Australian industry practice.

Key fire and life safety project features, which have been developed using applicable standards and guidelines, include:

- The main alignment tunnels are uni-directional, reducing the likelihood of vehicle crashes
- Prohibition of vehicles carrying dangerous goods entering the tunnels, reducing the likelihood of fire and release of toxic materials
- Fires in the tunnels would be detected automatically through a closed circuit television monitoring system and linear heat detection
- A deluge fire suppression system would be activated manually or automatically at the fire source. Automatic foam suppression systems would be used in the tunnel drainage sump and activated through hydrocarbon detectors. Automatic fire sprinkler systems located in the fire pump rooms (located on the surface near the western portal and St Peters interchange) would be activated by pre-set temperature sprinkler heads
- Longitudinal ventilation would direct smoke in the direction of traffic flow from the fire source towards an extraction point or tunnel exit portal
- The inclusion of stop lights, portal closure barriers, moveable median barriers, lane control units and variable message signs
- The New M5 motorway control centre located at the Burrows Road motorway operations complex (MOC5) including:
  - Two simulation and training servers
  - A data storage system
  - Four operator workstations
  - A video wall system
  - Two large monitors and CCTV controls to display CCTV footage.

The likelihood of a fire incident during operation of the project cannot be entirely removed. Uncontrollable human factors inherently lead to a residual risk of incidents and accidents, albeit the likelihood of such events would be low.

The tunnel would be well equipped to effectively manage crash or incident and more so than crashes or incidents on surface roads. The tunnel would be continuously monitored, allowing for much faster response times for emergency services and in the event of an accident involving a fire, the tunnel deluge system would quickly put the fire out rather than needing to wait for emergency services to arrive on the scene.

In the event of an incident:

- Approaching vehicles would be prevented from entering both tunnels using stop lights, portal closure barriers, moveable median barriers, lane control units and variable message signs
- Motorists involved in the fire event, or upstream of the fire source, would be instructed to stop their vehicles, and exit on foot in the opposite direction along the carriageway / ramp (as this region would be protected by the smoke management system), or through an exit door to an egress passage leading to a place of relative safety
- Motorists downstream of the fire source are encouraged to continue driving out of the tunnel. If this is not possible (e.g. congested traffic) and they must evacuate on foot, using an exit door to an egress passage leading to the non-incident carriageway/ramp
- Emergency services would reach the fire source via the non-incident tunnel (by vehicle or foot), or from the upstream direction in the incident tunnel (by foot).

The smoke extraction points would operate, removing smoke from the tunnels. If the fire is upstream of the smoke extraction point, the smoke would be ventilated to the smoke exhaust point and extracted to reduce the length of the tunnel affected by smoke. If the fire is downstream of the smoke extraction point, the smoke would be ventilated to the portals and discharged via the portals.

Depending on the location of the incident, smoke would be emitted from the project tunnels at one or more of the following locations:

- Bexley Road South motorway operations complex (MOC2)
- Arncliffe motorway operations complex (MOC3)
- The western and eastern tunnel portals.

Probability of tunnel fires

A summary of available tunnel fire incident data for Australia is provided in **Table 26-5**. An historical tunnel fire frequency based on a vehicle-kilometre basis for two of the tunnels listed in **Table 26-5** can be calculated:

- For the Lane Cove Tunnel, historical fire frequency has been around 0.61 fires per 100 million vehicle kilometres (all vehicles)
- For the CityLink Tunnels, historical fire frequency has been around 0.5 fires per 100 million vehicle kilometres (all vehicles).

Based on traffic forecasts, the main alignment tunnels are anticipated to experience around 92 million vehicle kilometres in 2019 and around 110 million vehicle kilometres in 2031. Applying similar tunnel fire frequencies to forecast traffic volumes for the project indicates:

- An expected annual tunnel fire frequency of 0.47 to 0.56 is expected in 2021 (equivalent to about one fire incident every 1.8 to 2.1 years)
- An expected annual tunnel fire frequency of 0.55 to 0.66 is expected in 2031 (equivalent to one fire incident every 1.5 to 1.8 years).

These values are comparable to observed annual tunnel fire incident rates for other Australian tunnels present in **Table 26-5**, which range from around 0.06 to 0.93 per year, or around 0.5 to one per 100 million vehicle kilometres.

Details regarding traffic volumes with and without the project are provided in **Chapter 9** (Traffic and Transport).

Table 26-5 Tunnel fire frequency based on available data for Australian tunnels (up to 2014)

Tunnel	Length	Opened to traffic	Comments on fire incidents	Traffic volumes	Incident frequency
Sydney Harbour Tunnel	Two tunnels, each 2.7 kilometres	August 1992	Around 10 fires since opening (around 0.45 per year)	Around 80,000 vehicles per day Around 86 million vehicle kilometres per annum	0.5 per 100 million vehicle kilometre
M5 East Motorway Tunnel	Two tunnels, each 4 kilometres	December 2001	Around 72 fire and smoke / fume incidents between 2002 and 2009, although this include non-fire incidents (ie vehicle exhaust / fume events are included in the figure) A recent heavy vehicle fire (August 2012) led to closure of the tunnel (and reopened within two hours), operation of the deluge system and fire brigade response.	Around 90,000 vehicles per day Around 130 million vehicle kilometres per annum	Insufficient data
M2 Motorway Tunnel (Norfolk Tunnel)	Two tunnels, each 0.5 kilometres	May 1997	One heavy vehicle fire since opening (around 0.06 per year). The fire (September 2013) led to closure of the tunnel (and reopened in three hours), operation of the deluge system and fire brigade response. The fire started in the vehicle's engine compartment.	Around 50,000 vehicles per day Around nine million vehicles per annum	0.7 per 100 million vehicle kilometres

Tunnel	Length	Opened to traffic	Comments on fire incidents	Traffic volumes	Incident frequency
Cross City Tunnel	Two tunnels, each 2.1 kilometres	August 2005	Two fires recorded since the tunnel was opened in 2005 (around 0.22 per year). Of these fire incidents, one required the operation of the deluge system. The second fire was extinguished without the need for deluge.	Around 30,000 vehicles per day Around 23 million kilometres per annum	1.0 per 100 million vehicle kilometres
CityLink Tunnels (Burnley Tunnel and Domain Tunnel)	Burnley Tunnel – two tunnels each 3.4 kilometres Domain Tunnel – two tunnels each 1.6 kilometres	December 2000	A total of 13 fires recorded since the tunnels were opened in late 2000 (around 0.93 per year). Of these fires, seven related to vehicle fires where there vehicle was driven through and exited the tunnels without incident. Three of the fires required use of the deluge system and the remaining three fires required use of extinguishers. The most significant fire to occur was a result of a major car/ truck collision in the Burnley Tunnel in 2007. This incident resulted in three fatalities and required closure of the tunnel for four days.	Around 55,000 (Burnley) and 45,000 (Domain) vehicles per day Around 94 million vehicle kilometres per annum (combined)	0.5 per 100 million vehicle kilometres (fires within the tunnel only)
Lane Cove Tunnel	Two tunnels, each 3.6 kilometres	March 2007	A total of three fires recorded since the tunnels were opened in 2007 (around 0.43 per year). All of these fires required use of the deluge system.	Around 66,000 vehicles per day Around 87 million vehicle kilometres per annum	0.5 per 100 million vehicle kilometres

Incidents on surface roads

As with underground components of the project, surface roads and infrastructure have been designed to provide an efficient and safe road network.

The project is expected to result in the following traffic related benefits:

- Improved travel times and reliability
- Improved movement of freight to and from the Port Botany area
- Provide an express route between South-western Sydney and Sydney Airport.

These traffic related benefits would result in an improved safety environment and a reduction in incidents along the corridor. The project would facilitate an overall improvement in road safety performance of the Princes Highway, Canal Road / Ricketty Street / Gardeners Road and Bourke Road around the St Peters interchange and local road upgrade as a result of charged traffic volumes and proposed intersection upgrades.

An increase in the total number of crashes is expected on Euston Road due to an increase in forecast traffic. However about 85 per cent of crashes on Euston Road occur at the Euston Road / Sydney Park Road intersection. This intersection would be signalised as part of the local roads upgrades and would be an effective approach to reducing the number of accidents.

Forecasted crash statistics on local roads around the St Peters interchange are described in **Section 9.3.2** (**Chapter 9** (Traffic and Transport)).

Electric and magnetic fields

The *Draft Radiation Standard – Exposure Limits for Magnetic Fields* (Australian Radiation Protection and Nuclear Safety Agency, December 2006) was released in 1996 based on a large body of scientific research since 1989 and proposed a series of exposure standards to replace the *Interim Guidelines on Limits of Exposure to 50 / 60 Hz Electric and Magnetic Fields* (National Health and Medical Research Council, 1989).

Although the Draft Radiation Standard has never been finalised and published, the exposure limits presented are typically applied when considering electric and magnetic fields from new development. The project would include the provision of four aboveground substations, located at Kingsgrove motorway operations complex (MOC1), Bexley Road South motorway operations complex (MCO2), Arncliffe motorway operations complex (MOC3) and St Peters motorway operations complex (MOC4).

The detailed design of project substations would ensure that the exposure limits for the general public in the *Draft Radiation Standard – Exposure Limits for Magnetic Fields* (Australian Radiation Protection and Nuclear Safety Agency, December 2006) would not be exceeded at the boundary of the substation sites.

Bushfire

It is unlikely that a bushfire would occur within the project corridor, due to the urbanised nature of the area. Bushfire prone land mapping for the Hurstville local government area does not identify bushfire prone land within the project corridor. Other local government areas relevant to the project are highly urbanised and do not contain large areas of vegetation that are associated with a larger bushfire risk.

The operational infrastructure of the project is largely invulnerable to bush fire due to its incombustible nature (road surface materials, retaining walls, road barriers) and the fact that a lot of the infrastructure is in tunnels underground.

The project would not increase the extent of bushfire prone land.

Aviation risks

The operational design of the project has considered airspace protection and associated risks and hazards. As discussed in **Chapter 2** (Assessment process), under the *Airports Act 1996* (Commonwealth), a 'controlled activity' in relation to a prescribed airspace must not be carried out or caused to be carried out without the approval of the Secretary of the Commonwealth Department of Infrastructure and Regional Development or otherwise exempt under the Airspace Regulations. Controlled activities under the *Airports Act 1996* (Commonwealth) include (depending on the precise event or occurrence):

- The construction of buildings and structures that intrude into prescribed airspace
- Artificial light sources that exceed specified intensity levels
- Activities that result in air turbulence that exceed specified levels
- Activities that involve the emission of smoke, dust, other particulate matter, steam or other gas that exceed specified levels.

The St Peters interchange and associated local road upgrades, Arncliffe motorway operations complex (MOC3), St Peters motorway operations complex (MOC4), Burrows Road motorway operations complex (MOC5) and other ancillary infrastructure around the eastern portal would be located near flight paths used for Sydney Airport.

No buildings and structures that form part of the project are designed to intrude into prescribed airspace. The ventilation outlets at Kingsgrove, Arncliffe and St Peters motorway operations complexes (MOC1, MOC3 and MOC4) are also designed to be below prescribed airspace heights.

However, as a result of the proposed operation of the Arncliffe and St Peters ventilation facilities, including discharge of tunnel emissions, the project has been deemed a controlled activity and an assessment under the *Airport Act 1996* will be required to consider impacts of the project on airport operations. Further, approval of the project by the Secretary of the Commonwealth Department of Infrastructure and Regional Development is required.

An aviation impact assessment has been carried out to assess the impacts of the operation of the ventilation outlets at Kingsgrove, Arncliffe and St Peters ventilation facilities (MOC1, MOC3 and MOC4). This assessment included a plume rise assessment and considered the building induced windshear and turbulence assessment that would occur during operation of the ventilation facilities. Predictive modelling results indicate that the maximum velocity at would be less than the (procedures for air navigation services – aircraft operations) limit of 4.3 metres per second. The results of the Aviation Impact Assessment have been submitted to the Civil Aviation Safety Authority for determination of whether the requirements of Civil Aviation Safety Authority have been met to the satisfaction of the Department of Infrastructure and Regional Development.

The application for approval of the project under the *Airports Act 1996* has been made concurrently with the preparation of this EIS. The project has been designed to satisfy requirements set by the Civil Aviation Safety Authority (refer to **Section 4.6.1** and **Section 5.8.2**).

Aviation hazard lighting may be required on ventilation outlets at Arncliffe and St Peters motorway operations complexes (MOC3 and MOC4). Surface road lighting would include an 'aeroscreen' type lens to minimise upwards waste light. Aviation hazard lighting and surface road lighting would be in accordance with the requirements of the Civil Aviation Safety Authority and Sydney Airport.

26.2 Environmental management measures

As described throughout this chapter, the project has been designed to minimise the likelihood of incidents and accidents. Environmental management measures relating to hazards and risk are outlined in **Table 26-6**. In addition to these measures, a Work health and Safety Plan would be implemented during construction of the project. This would support the management measures and procedures included in the Construction Environmental Management Plan for the project and would be supplemented by site and activity specific Safe Work Method Statements.

Table 26-6 Environment management measures – hazards and risk

Impact	No.	Environmental management measure	Timing
Construction			
General	HR01	Site-specific hazard and risk management measures would be included within the Construction Environmental Management Plan (CEMP), which may include items such as: • Details of the hazards and risk associated with construction activities for both surface and subsurface works • Procedures to comply with legislative and industry standard requirements • Contingency plans, as required.	Pre-construction / construction
Storage of dangerous goods and hazardous substances	HR02	Storage of dangerous goods and hazardous materials would occur in accordance with suppliers' instructions and relevant Australian Standards and may include bulk storage tanks, chemical storage cabinets / containers or impervious bunds.	Construction
	HR03	Storage, handling and use of dangerous goods and hazardous substances would be in accordance with the *Work Health and Safety Act 2011* and the *Storage and Handling of Dangerous Goods Code of Practice* (WorkCover NSW, 2005).	Construction
	HR04	Secure, bunded areas would be provided around storage areas for oils, fuels and other hazardous liquids.	Construction
	HR05	Bunds would be provided around activities such as vehicle refuelling, servicing, maintenance or wash-down, where there is a potential for spills and contamination.	Construction
	HR06	Material Safety Data Sheets would be obtained for dangerous goods and hazardous substances stored onsite prior to their arrival.	Construction

Impact	No.	Environmental management measure	Timing
Transportation of dangerous goods and hazardous substances	HR07	Transport of dangerous goods and hazardous substances would be conducted in accordance with relevant legislation and codes, including the Dangerous Goods (*Road and Rail Transport) Regulation 2014* and the Australian Code for the *Transport of Dangerous Goods by Road and Rail* (National Transport Commission, 2008).	Construction
Aviation Measures	HR08	The project would be constructed in line with Civil Aviation Safety Authority requirements, to the satisfaction of the Secretary of the Commonwealth Department of Infrastructure and Regional Development.	Construction
Aviation Measures - lighting	HR09	The project would be constructed in in accordance with the requirements of the Civil Aviation Safety Authority and the *Sydney Airport Master Plan 2033*, with respect to lighting used during construction.	Construction
Operation			
Fire and life safety	OpHR01	The fire and safety systems and measures adopted for the project would be equivalent to or exceed the fire safety measures recommended by NFPA502 (American), PIARC (European), AS4825 (Australian) and Roads and Maritime standards.	Detailed Design
Storage of dangerous goods and hazardous substances	OpHR02	Storage of dangerous goods and hazardous materials would occur in accordance with supplier's instructions and relevant Australian standards and may include bulk storage tanks, chemical storage cabinets / containers or impervious bunds.	Operation
	OpHR03	Storage, handling and use of dangerous goods and hazardous substances would be in accordance with the Work Health and Safety Act 2011 and the Storage and Handling of Dangerous Goods Code of Practice (WorkCover NSW, 2005).	Operation
	OpHR04	Secure, bunded areas would be provided around storage areas for oils, fuels and other hazardous liquids. Impervious bunds would be of sufficient capacity to contain at least 110 per cent of the volume of the largest stored container.	Operation

Impact	No.	Environmental management measure	Timing
	OpHR05	Bunds would be provided around activities such as vehicle refuelling, servicing, maintenance or wash-down, where there is a potential for spills and contamination.	Operation
	OpHR06	Material Safety Data Sheets would be obtained for dangerous goods and hazardous substances stored onsite prior to their arrival.	Operation
Transportation of dangerous goods and hazardous substances	OpHR07	The transport of dangerous goods and hazardous substances would be prohibited through the main alignment tunnels and on and off-ramp tunnels.	Operation
Incident response	OpHR08	An Incident Response Plan would be developed and implemented in the event of an accident or incident.	Operation
	OpHR09	The response to incidents within the motorway would be managed in accordance with the memorandum of understanding between Roads and Maritime and the NSW Police Service, NSW Rural Fire Service, NSW Fire Brigade and other emergency services.	Operation
Electric and magnetic fields	OpHR10	The detailed design of the project substations would ensure that the exposure limits for the general public suggested by the Draft Radiation Standard (*Australian Radiation Protection and Nuclear Safety Agency*, *2006*) would not be exceeded at the boundary of the substation sites.	Detailed Design
Aviation Measures	OpHR11	The project would be operated in line with Civil Aviation Safety Authority requirements, to the satisfaction of the Secretary of the Commonwealth Department of Infrastructure and Regional Development.	Detailed Design
Aviation Measures - lighting	OpHR12	Aviation hazard lighting, building lighting and surface road lighting would be designed and operated in accordance with the requirements of the Civil Aviation Safety Authority and the *Sydney Airport Master Plan 2033*.	Detailed Design and Operation

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