# 21 Waste management

This chapter outlines the proposed waste management for the project. **Table 21-1** sets out the SEARs relevant to waste management and identifies where the requirements have been addressed in this EIS.

**Table 21-1 SEARs – Waste**

| Assessment requirements | Where addressed |
|---|---|
| Waste | |
| 1. The Proponent must assess predicted waste generated from the project during construction and operation, including: | Section 21.3 and section 21.4 |
| (a) classification of the waste in accordance with the current guidelines; | Section 21.3 |
| (b) estimates/ details of the quantity of each classification of waste to be generated during the construction of the project, including bulk earthworks and spoil balance; | Section 21.3 |
| (c) handling of waste including measures to facilitate segregation and prevent cross contamination; | Section 21.3 |
| (d) management of waste including estimated location and volume of stockpiles; | Section 21.3 |
| (e) waste minimisation and reuse; | Section 21.3 |
| (f) lawful disposal or recycling locations for each type of waste; and | Section 21.3 |
| (g) contingencies for the above, including managing unexpected waste volumes. | Section 21.5 |
| 2. The Proponent must assess potential environmental impacts from the excavation, handling, storage on site and transport of the waste particularly with relation to sediment/leachate control, noise and dust. | Section 21.3.6 and section 21.4.3 |

## 21.1 Assessment approach

A desktop assessment was carried out to consider the potential waste streams likely to be generated as part of the construction and operational stages of the project. Indicative quantities and types of waste that would be generated from the project have been estimated through a review of the indicative scale and extent of the project as outlined in **Chapter 6** (Project description), the construction methodology described in **Chapter 7** (Construction) and review of construction waste quantities for similar projects.

Management and mitigation measures were then developed with respect to the relevant legislation and guidelines as outlined below.

## 21.2 Legislative framework

The key legislative instruments which manage waste in NSW are:

- *Waste Avoidance and Resource Recovery Act 2001* (NSW) (WARR Act)
- *Protection of the Environment Operations Act 1997* (POEO Act)
- *Protection of the Environment Operations (Waste) Regulation 2014* (NSW) (POEO Regulation).

Other guidelines which have been considered for this assessment include:

- Waste Classification Guidelines: Part 1 Classifying Waste (NSW EPA 2014)
- Waste Classification Guidelines: Part 4 Acid sulfate soils (NSW EPA 2014)
- Technical Guide – Management of road construction and maintenance wastes (NSW Roads and Maritime Services (Roads and Maritime) 2016).

## 21.3 Construction waste management

All wastes generated during construction of the project would be managed using the waste hierarchy approach of avoidance and re-use before consideration of waste disposal. All wastes would be managed in accordance with the waste provisions contained within the POEO Act and, where reused off site, would comply with relevant NSW EPA resource recovery exemptions.

Should waste be found to be unsuitable for reuse or recycling, disposal methods would be selected based on the classification of the waste material in accordance with the Waste Classification Guidelines: Part 1 Classifying Waste (NSW EPA 2014). The Waste Classification Guidelines provide direction on the classification of waste, specifying requirements for management, transportation and disposal of each waste category.

Resource recovery will be applied to the management of construction waste and will include:

- Recovery of resources for reuse - reusable materials generated by the project will be segregated for reuse on site, or off site where possible, including the reuse of the major waste streams (VENM)
- Recovery of resources for recycling - recyclable resources (such as metals, plastics and other recyclable materials) generated during construction and demolition will be segregated for recycling and sent to an appropriate recycling facility for processing
- Recovery of resources for reprocessing - cleared vegetation will be mulched or chipped on-site and used for landscaping, in the absence of a higher beneficial use being identified.

### 21.3.1 Waste streams

Waste streams generated during construction of the project and their expected classification are outlined in **Table 21-2**.

**Table 21-2 Anticipated construction waste types**

| Activity | Waste streams produced | Expected classification | Waste management strategy |
|---|---|---|---|
| Site establishment and enabling works | Vegetation waste from the removal of trees, shrubs and ground cover that are unable to be mulched and reused within the project. | General solid waste (putrescible) | Minimise areas of vegetation to be cleared by the project. |
| Demolition of existing structures | Demolition wastes including concrete, bricks, tiles, timber (untreated and treated), metals, plasterboard, carpets, electrical and plumbing fittings and furnishings (doors, windows). May also include asbestos and lead paint. | General solid waste (non-putrescible), Special waste and/or Hazardous waste | Concrete and bricks to be demolished using low impact blasting techniques so as to maintain the structure of the material, and thus its reusability. All other materials are to be disassembled and removed carefully to maximise the potential for reuse and recycling. Hazardous waste is to be removed by a qualified handler for recycling or recovery of energy where possible. |
| Operation of construction machinery | Waste from operation and maintenance of construction vehicles and machinery including adhesives, lubricants, waste fuels and oils, engine coolant, batteries, hoses and tyres. | Hazardous waste, Special waste and Liquid waste | Liquid waste to be collected and transferred to a dedicated recycling facility where possible, to ensure diversion from landfill.<br>Batteries are to be collected and recycled by a qualified handler. |
| Tunnelling and earthworks | Excavated wastes (spoil), such as soil and rock, primarily from tunnelling and cutting including virgin excavated natural material (VENM). | General solid waste (non-putrescible) | Minimise excavation and tunnelling through alignment design, cross section of tunnel and construction techniques (i.e. use road headers instead of tunnel boring machines to excavate tunnel). |

| Activity | Waste streams produced | Expected classification | Waste management strategy |
|---|---|---|---|
| Tunnelling and earthworks | Asbestos and hazardous waste (including contaminated spoil). | Hazardous waste and/or special waste | Disposed of offsite. |
| Construction of permanent operational infrastructure | General construction waste such as timber formwork, scrap metal, steel, concrete, plasterboards and packaging material (crates, pallets, cartons, plastics and wrapping materials). | General solid waste (non-putrescible) | All materials that are potentially recyclable and should be disassembled and removed carefully to maximise further reuse and recycling. To ensure diversion from landfill, waste materials should be clearly separated and stored on-site, monitored and maintained by the site's environment/waste manager. |
| Construction of permanent operational infrastructure | Surplus construction material and general site reinstatement waste such as fencing, sediment, concrete, steel, formwork and sand bags. | General solid waste (non-putrescible) | As a priority, surplus construction materials may be transferred to other sites for use, or stored by the contractor for future use. In the second instance, surplus construction materials may be recycled where possible. Surplus materials should avoid being sent to landfill. |
| Drainage and water management infrastructure | Sediment laden/ potentially contaminated wastewater. | Liquid waste | The contractor may consult with Sydney Water regarding the disposal of potentially contaminated wastewater to the sewer for treatment. |
| Activities at site offices | General wastes from site offices such as putrescibles, paper, cardboard, plastics, glass and printer cartridges. | General solid waste (non-putrescible) and General solid waste (putrescible) | All waste and recycling generated by the site offices should be source-separated into the following dedicated bins:<br>• General waste<br>• Co-mingled recycling<br>• Paper/cardboard<br>• Toner/cartridges<br>The segregation of recyclables from the general waste stream will maximise resource recovery and minimise materials sent to landfill. All bins should be clearly labelled and coloured to reflect the correct stream. All staff should be trained about the internal office waste management system to ensure adequate understanding across all employees. |
| Construction of the permanent power supply route | Surplus construction material and general site reinstatement waste such as demarcation fencing, sediment, concrete, formwork and sand bags.<br>Vegetation waste from the removal of ground cover that is unable to be reused within the project. | General solid waste (putrescible) | As a priority, surplus construction materials may be transferred to other sites for use, or stored by the contractor for future use. In the second instance, surplus construction materials may be recycled where possible. Surplus materials should avoid being sent to landfill.<br>Vegetation waste may be collected and transferred to a dedicated green waste recycling facility for garden and food organics to ensure diversion from landfill. |

Notes:
1 Classified in accordance with the Waste Classification Guidelines: Part 1 Classifying Waste (NSW EPA, 2014).

### 21.3.2 Waste disposal locations

There are a number of options for recycling and disposal of construction and operation waste generated by the project. A large number or waste facilities in Sydney are licensed to accept general solid waste (putrescible) and general solid waste (non-putrescible). Specific facilities and collection contractors for the disposal of putrescible and non-putrescible general solid waste would be selected during the later stages of the project and documented in the construction waste management plan.

Recyclables generated during construction and operation of the project would be collected by an authorised contractor for off-site recycling. There are a number of resource recovery facilities in Sydney. Recycling facilities for the project would be determined by the contractor engaged to collect the material.

Special and hazardous wastes would be disposed of at appropriately licensed waste management facilities to be selected during the later stages of the project and documented in the construction waste management plan.

Wastewater generated as a result of construction activities is considered to be 'construction wastewater'. Construction wastewater would be tested and treated at a construction water treatment plant (if required) and then reused on site wherever feasible, or discharged into the local stormwater system in accordance with the requirements of the POEO Act (refer to **Chapter 18** (Surface water and flooding)).

### 21.3.3 Spoil management

#### Spoil generation and management

The most significant waste stream associated with the project is spoil generated from the excavation of the tunnels that is in excess of project requirements. Smaller quantities of spoil would be generated by excavation required for surface components of the project. Anticipated spoil volumes generated from tunnelling and surface works are outlined in **Table 21-3**. Around 1,098,242 cubic metres of spoil would be generated during construction of the project.

**Table 21-3 Anticipated spoil types**

| Waste type | Expected classification | Estimated Spoil Volume ($m^3$)[1] |
|---|---|---|
| Clean spoil (suitable for reuse on site) | General solid waste (non-putrescible) | 965,044 |
| Contaminated material for landfill from cut-and-cover excavation at President Avenue | General solid waste (non-putrescible), Restricted waste, Hazardous waste and/or Special waste[2] | 77,519 |
| Unsuitable material (alluvium spoil which is not suitable for reuse on site) | General solid waste (non-putrescible) | 3,463 |
| Acid sulfate soils | N/A | 110,434 |
| Construction and demolition waste (from President Avenue surface works) | General solid waste (non-putrescible) and Special waste[2] | 1450 |
| Total | | 1,098,242 |

Notes:
1 Classified in accordance with the Waste Classification Guidelines: Part 1 Classifying Waste (NSW EPA, 2014).
2 Spoil would be classified in accordance with the Waste Classification Guidelines: Part 1 Classifying Waste (NSW EPA, 2014) prior to disposal.

Around 191,416 $m^3$ of general solid waste (non-putrescible) is estimated to be generated during the construction of the project. The volumes of the other classifications of waste (identified in **Table 21-2**) to be generated during the construction of the project were not able to be estimated at this stage.

A contamination assessment has been carried out as part of this EIS (refer to **Chapter 16** (Soils and contamination)). This assessment identified existing contamination issues primarily related to historical land uses which have adversely impacted the quality of soil, fill, groundwater, ground gas and surface water within the project footprint.

#### Spoil management hierarchy

The project design has considered the principles of the resource management hierarchy as defined in the WARR Act, including minimising excess spoil generation as far as practical. Where possible and fit for purpose, spoil would be beneficially reused as part of the project before alternative spoil disposal options are pursued. Excess spoil which cannot be reused or recycled would be disposed of at a suitably licensed waste management facility.

The project would target a 95 per cent beneficial re-use of the usable spoil, either within the project or at other locations. Spoil reuse would be prioritised in accordance with the spoil management hierarchy outlined below.

- Minimisation of spoil generation through design and management
- Reuse of spoil within the project
- Beneficial reuse of spoil outside the project
- Where reuse is not possible, disposal of spoil would be the last resort.

The spoil reuse opportunities identified for the project have been outlined in order of preference in **Table 21-4** below.

**Table 21-4 Spoil reuse options**

| Option | Potential options for reuse of spoil |
|---|---|
| Reuse within the project site | • The use of tunnel spoil for the backfill of cut-and-cover tunnels and the infill of temporary access shafts and declines<br>• The use of tunnel spoil as fill to raise President Avenue above the flood level. |
| Beneficial reuse of spoil outside the project for environmental benefit | • Reuse of spoil for environmental restoration projects (e.g. flood mitigation and coastal protection projects). |
| Reuse of spoil outside the project on other projects | • Reuse of spoil as fill on other development projects with consideration of financial feasibility and traffic impacts<br>• Reuse of spoil for land reclamation or remediation projects with consideration of financial feasibility and traffic impacts. |
| Reuse of spoil outside the project for land restoration | • Reuse of spoil for fill on land restoration projects (e.g. to rehabilitate disused mines or quarries) with consideration of financial feasibility and traffic impacts. |
| Reuse of spoil outside the project for other purposes | • Reuse of spoil for land management purposes (e.g. capping or covering of landfill waste) with consideration of financial feasibility and traffic impacts. |

Spoil that is in excess of project requirements and that meets the classification of VENM would be preferentially/ beneficially re-used in other projects that require engineered fill. **Table 21-6** shows the potential spoil management and disposal sites.

The construction traffic and transport assessment has taken into account heavy vehicle movements associated with spoil management. **Chapter 8** (Traffic and transport) provides a summary of heavy vehicle movements including spoil related haulage.

### Stockpile management

Stockpiles would be located at the following construction ancillary facilities:

- Arncliffe construction ancillary facility (C1)
- Rockdale construction ancillary facility (C2)
- President Avenue construction ancillary facility (C3)
- Shared cycle and pedestrian pathways construction ancillary facilities (C4/C5).

The estimated stockpile volumes at these construction ancillary facilities are provided in **Table 21-5**. Stockpile material at the Arncliffe construction ancillary facility (C1) would consist primarily of spoil, while stockpile material at the Rockdale construction ancillary facility (C2) and President Avenue construction ancillary facility (C3) would consist of spoil and excavated infrastructure.

Stockpile material at the shared cycle and pedestrian pathways construction ancillary facilities (C4/C5) construction ancillary facilities would consist of topsoil stripping material from where topsoil stripping has been undertaken and the stripping material cannot be moved off site during construction.

The Princes Highway construction ancillary facility (C6) would not be used for stockpiling spoil material. This facility would primarily be used for the laydown of construction equipment and parking of construction vehicles required for the construction of the President Avenue and Princes Highway intersection upgrade. The site would also include some offices, amenities and workshops.

**Table 21-5 Estimated stockpile volumes**

| Stockpile location | Estimated stockpile volume ($m^3$) |
|---|---|
| Arncliffe construction ancillary facility (C1) | 2,500 |
| Rockdale construction ancillary facility (C2) | 5,500 |
| President Avenue construction ancillary facility (C3) | 2,500 |
| Shared cycle and pedestrian pathways construction ancillary facilities (C4/C5) | 300 |

Spoil stockpiles would be located away from adjacent sensitive receptors where possible and contained within tunnels at Rockdale construction ancillary facility (C2) or cut-and-cover tunnel structures at President Avenue construction ancillary facility (C3). Spoil stockpiles would be contained within spoil sheds. Where excavations are carried out prior to the construction of tunnel structures, spoil would be stored on the surface or loaded into trucks directly from excavation areas.

Stockpile management procedures for segregating spoil, preventing cross-contamination of clean spoil with contaminated spoil and odour management would be included in the Construction Environmental Management Plan (CEMP). Potential impacts from runoff and sedimentation would be further minimised through the implementation of the environmental management measures described in **Chapter 16** (Soils and contamination) and **Chapter 18** (Surface Water and flooding).

Potential impacts related to dust and noise and vibration associated with the management of stockpiles are discussed in **Chapter 9** (Air quality) and **Chapter 11** (Noise and vibration) respectively.

### Spoil reuse and disposal sites

Excess spoil that cannot be reused within the project would require off-site reuse/disposal. Around 95 per cent of uncontaminated spoil would be beneficially reused in accordance with the project spoil management hierarchy.

Eight potential sites have been identified for receiving excess spoil from the project, as summarised in **Table 21-6**. Negotiations for the final destinations for excess spoil would be carried out during detailed design and may include the sites listed in **Table 21-6** or other alternative sites.

**Table 21-6 Potential spoil management and disposal sites**

| Site | Location | Distance from the project (kilometres_ | Capacity |
|---|---|---|---|
| Horsley Park (manufacturing facility) | Wallgrove Road at Horsley Park | About 40 | 250,000 |
| Blacktown Waste Services (landfill) | 920 Richmond Road at Marsden Park | About 70 | 250,000 |
| Sakkara Development (industrial estate) | Riverstone Parade at Riverstone | About 45 | 3,500,000 |
| Kurnell Landfill | 330 Captain Cook Drive at Kurnell | About 20 | 5,000,000 |
| Lenore Drive, Erskine Park | Lenore Drive, Erskine Park | About 50 | 250,000 |
| Development sites within North West Growth Area | Marsden Park, Hollinsworth Road | About 70 | 1,000,000 - 3,000,000 |
| Development sites within South West Growth Area | Oran Park Drive, Bringelly | About 50 | 1,000,000 - 3,000,000 |
| Badgerys Creek | Badgerys Creek Road, Badgerys Creek | About 50 | 1,000,000 - 3,000,000 |

Spoil would be delivered to the spoil management sites in accordance with the conditions of approval and environment protection licences governing those sites. The spoil reuse and disposal sites identified above are based on the current existing availability of spoil receiving locations (including projects with a fill deficit) across the Sydney area. Construction of the project would occur over a four year period, with spoil generation peaking in year two.

The following criteria would be applied to determine the priority given to the identified spoil reuse and disposal sites, including how much spoil would be sent to each site, and to evaluate any additional spoil reuse or disposal options that emerge during construction:

- Environmental benefit - preference for the material to be reused for environmental works (e.g. coastal protection works), clean fill on other projects, or land restoration
- Traffic impacts – with a preference for haulage routes that keep to major arterial roads and minimise total haulage requirements as far as possible
- Approvals – any receiving location would need to be approved to receive the applicable type and volume of spoil
- Economic feasibility – feasibility of transporting the spoil compared to the options already identified, including consideration of the distances to be travelled.

Spoil would be hauled using heavy vehicles to spoil reuse and disposal sites. The anticipated spoil haulage routes are outlined in **Chapter 7** (Construction). Additional disposal/reuse sites would be determined based on need at the time spoil is generated and additional sites not listed above may be used. Further details regarding spoil generation and management are provided in **Chapter 7** (Construction) and in **Chapter 8** (Traffic and transport).

### Contaminated spoil

A contamination assessment completed as part of this EIS identified areas of potential and confirmed contamination as outlined in **section 21.3.3**.

If previously unidentified contaminated material is discovered during construction, the contaminated material would be managed in accordance with an unexpected contaminated lands discovery procedure, as outlined in the Guideline for the Management of Contamination (Roads and Maritime 2013).

Spoil, including contaminated spoil, would be classified in accordance with the Waste Classification Guidelines: Part 1 Classifying Waste (NSW EPA 2014). Depending on the extent of contamination, spoil would be considered for reuse on the project site or, where reuse is not possible, disposed of lawfully at an appropriately licensed facility.

Suitable areas would be identified to allow for contingency management of unexpected waste materials, including contaminated materials. Suitable hardstand or lined areas would be required that are appropriately stabilised and bunded, with sufficient area for stockpile storage and segregation.

Material that is identified as contaminated would be segregated from uncontaminated material on site to prevent cross-contamination. A detailed sub-plan to the CEMP for the project would describe methodologies and strategies to prevent cross-contamination.

A number of waste facilities in Sydney are licensed to accept contaminated waste. Specific facilities would be selected during the later stages of the project and documented in the construction waste management plan.

## 21.3.4 Special wastes

### Acid sulfate soils

There is the potential for acid sulfate soils to be present within the project footprint. High risk areas include:

- An area surrounding the drainage line running south and perpendicular to Spring Street into Muddy Creek
- The low lying areas along Muddy Creek and in the industrial area at Rockdale
- The low lying areas surrounding Scarborough Ponds including Rockdale Bicentennial Park and Memorial Fields.

Procedures to manage acid sulfate soils would be included in a Construction Soil and Water Management Plan that would be prepared as part of the CEMP.

Identified acid sulfate soil material would be stored temporarily in a bunded area and treated on site before being transported and disposed of off-site at a licensed facility. Management of acid sulfate soils would be in accordance with the Guideline for the Management of Acid Sulfate Materials[1].

### Asbestos

Asbestos has been identified within fill at the Arncliffe construction ancillary facility (C1) and President Avenue construction ancillary facility (C3) and is likely to be present at other locations within the project footprint. The excavation, handling, storage, movement and disposal of ACM would be undertaken in accordance with procedures detailed in an Asbestos Management Plan.

A number of waste facilities in Sydney are licenced to accept asbestos. Specific facilities and collection contractors for the disposal of asbestos waste would be selected during the later stages of the project and documented in the construction waste management plan.

### Heavy metals

Heavy metals have been identified within groundwater in locations along the tunnel alignment and within groundwater and soils at the President Avenue construction ancillary facility and are likely to be present at other locations within the project footprint.

[1] Roads and Traffic Authority (2005) *Guidelines for the Management of Acid Sulfate Materials.*

The excavation, handling, storage, movement and disposal of waste material that is identified as being contaminated with heavy metals would be undertaken in strict accordance with the procedures detailed in the CEMP and the Work Health and Safety Regulation 2011 (NSW). A number of waste facilities in Sydney are licenced to accept contaminated spoil. Specific facilities and collection contractors for the disposal of contaminated spoil would be selected during the later stages of the project and documented in the construction waste management plan.

### 21.3.5 Wastewater

Wastewater would be generated predominantly during tunnel construction. Tunnel construction would result in significant volumes of groundwater inflow which would require collection, treatment and disposal. Volumes generated would vary depending on construction activity, tunnel groundwater infiltration rate and excavated tunnel length. Other sources of wastewater during construction include dust suppression, washdown areas and stormwater runoff from construction ancillary facilities. Indicative total wastewater volumes generated over the duration of the construction period are identified in **Table 21-7**.

Construction water would be reused on site wherever feasible, or discharged into the local stormwater system in accordance with the requirements of the POEO Act. The reuse of treated water would be considered in preference to discharge to the stormwater system or the Cooks River. Preference would be given to reusing as much water as feasible before discharging.

Further information is provided in **Chapter 18** (Surface water and flooding) including potential impacts associated with construction stormwater runoff.

**Table 21-7 Indicative wastewater volumes**

| Construction ancillary facility | Estimated daily discharge (kilolitres) | Discharge point |
|---|---|---|
| Arncliffe construction ancillary facility (C1) | 500 | Cooks River |
| Rockdale construction ancillary facility (C2) | 200 | Muddy Creek |
| President Avenue construction ancillary facility (C3) | Variable – 400 typical, up to 1600 short term rate | Muddy Creek |
| Shared cycle and pedestrian pathways east construction ancillary facility (C4) | 2.5 | Discharges from C4 and C5 would be minor only due to their relatively small footprint, with negligible hydrologic impact. |
| Shared cycle and pedestrian pathways west construction ancillary facility (C5) | 1.7 | |
| Princes Highway construction ancillary facility (C6) | 4.9 | Muddy Creek |

Water treatment plants would be located at each of the construction ancillary facilities that would support tunnelling. These would receive water pumped from the low point of each tunnel and temporary sumps would treat the water so that it is suitable for reuse during tunnelling and construction generally, or for appropriate discharge or disposal

Details of water treatment methods, proposed discharge locations, the existing water quality of potential receiving waterways and proposed discharge criteria and volumes are in **Chapter 18** (Surface water and flooding). Discharge criteria for the project would be further developed during detailed design and subsequently documented in relevant management plans.

### 21.3.6 Potential impacts

Potential impacts associated with construction waste for the project include:

- Large volumes of spoil directed to landfill due to inadequate recycling and reuse
- Large volumes of waste being directed to landfill due to inadequate collection, classification and disposal of waste
- Contamination of soil, surface and/or groundwater from the inappropriate excavation, storage, transport and disposal of liquid and solid waste
- Risks to human health from the handling, storage, transport and disposal of contaminated waste (including asbestos) generated by the project
- Dust impacts due to incorrect storage, handling, transport and disposal of spoil (refer to **Chapter 9** (Air quality))
- Noise impacts associated with waste disposal (refer to **Chapter 11** (Noise and vibration))
- Traffic impacts associated with transport of spoil and waste (refer to **Chapter 8** (Traffic and transport)).

Construction waste management activities would not pose a significant risk to the environment or human health, with the implementation of the management measures provided in **section 21.5**. A Construction Waste Management Plan would be prepared and implemented as part of the CEMP for the project. A Sustainability Management Plan would also be developed outlining ways to optimise resource efficiency and waste management during construction and operation of the project. These plans would take into account construction staging and specific conditions of approval that may be applied to the project.

### 21.3.7 Cumulative impacts

Cumulative impacts could occur if the disposal of large volumes of spoil is required at the same time as other tunnelling projects in Sydney. No other cumulative impacts are anticipated as a result of construction waste management for the project.

Construction of the project would occur at the same time as other tunnelling projects in Sydney, including:

- Westconnex (M4-M5 Link, New M5 Motorway, M4 East)
- Sydney Metro City and Southwest.

The tunnelling projects listed above would also require the management and disposal of large volumes of spoil. Cumulative impacts would arise if the spoil management sites identified for the project reach capacity as a result of receiving spoil from other tunnelling projects. Cumulative impacts may also arise where multiple tunnelling projects use the same spoil management sites and/or haulage routes.

Estimated spoil volumes and potential spoil management sites for the project and for other tunnelling projects (as identified in their respective environmental assessments) are outlined in **Table 21-8**.

Spoil management site options would continue to be investigated during detailed design. Internal coordination with the proponents of the tunnelling projects identified in **Table 21-8** would be undertaken to encourage cooperative approaches to spoil management.

**Table 21-8 Estimated spoil volumes and spoil management site capacities for Sydney tunnelling projects**

| Project | Estimated spoil volume ($m^3$) | Spoil Management Sites (capacity in cubic metres) |
|---|---|---|
| F6 Extension Stage 1 | 1,098,242 | • Excess spoil would be transported to spoil management sites within the Sydney Metropolitan area, where feasible. |
| M4-M5 Link Project | 4,000,000 | • Horsley Park (4,000,000)<br>• Blacktown Waste Services (250,000)<br>• Sakkara Development, Riverstone (3,500,000)<br>• Kurnell Landfill (7,000,000)<br>• Moorebank Intermodal Terminal Precinct (2,500,000)<br>• Western Sydney Airport (Capacity unknown) |
| New M5 Motorway project | 3,200,000 | • Boral-CSR Brick Pit, Schofields (550,000)<br>• Quakers Hill (500,000)<br>• Horsley Park (3,000,000)<br>• Sakkara Development, Riverstone (3,500,000)<br>• Kurnell Landfill (7,000,000) |
| M4 East project | 2,400,000 | • Sakkara Development, Riverstone (3,500,000)<br>• Quakers Hill (600,000)<br>• Marsden Park (360,000)<br>• Horsley Park (2,400,000) |
| Sydney Metro City and Southwest | 2,400,000 | • CSR Quarry, Schofields (1,100,000)<br>• Horsley Park (No. 2 and No. 3 Plants only) (600,000)<br>• CSR Quarry, Schofields (1,100,000)<br>• CSR Quarry, Horsley Park (2,000,000)<br>• Hornsby Quarry (1,800,000)<br>• Gosford Quarry (2,500,000) |

Considering the combined capacity of the spoil management sites, it is unlikely that any one spoil management site would reach capacity and it is highly unlikely that all the sites would reach capacity at the same time.

## 21.4 Operational waste management

All wastes generated during operation of the project would be managed in accordance with relevant legislation and government policies. Waste streams generated during operation of the project would include maintenance waste and wastewater.

### 21.4.1 Maintenance waste

Wastes would be generated during routine maintenance and repair activities required during operation of the project. The type and volume of wastes generated would depend on the nature of the activity, but would predominantly consist of minor volumes of oil and road materials, as well as contaminated waste resulting from potential fuel spills and leaks.

The volumes and types of waste would be typical of motorway operations and could be accommodated by existing metropolitan waste management facilities. Maintenance and repair activities would be subject to separate assessment processes, which would include the assessment of waste impacts associated with these activities.

With the implementation of standard work practices during routine maintenance and repair activities (which would be assessed separately from the project), the overall impact of operational waste streams would be minimal.

### 21.4.2 Wastewater

The mainline tunnel would include a drainage system to capture stormwater ingress, groundwater seepage, tunnel maintenance wash-down water, fire system operations, accidental ruptures of fire mains or hydrants, accidental spills by vehicles using the tunnel and fire system testing.

Captured water would be reused on site where feasible, discharged to the local stormwater system in accordance with POEO act requirements or treated and discharged to the Cooks River.

The New M5 Motorway operational water treatment facility at Arncliffe Motorway Operations Complex would be utilised to treat tunnel water and intermittent flows of other water sources (e.g. wash down water). Groundwater ingress for Stage 1 is expected to be up to around eight litres per second. Treated water would be preferentially reused on site for example for the irrigation of landscaped areas. Water which could not be beneficially reused on site would be discharged to the Cooks River or receiving stormwater systems.

Further information is provided in **Chapter 18** (Surface water and flooding) including potential impacts associated with operational stormwater runoff.

### 21.4.3 Potential impacts

The following waste management related impacts have the potential to occur as a result of the operation of the project:

- Contamination of soil, surface and/or groundwater due to the inappropriate transport, storage and disposal of waste and wastewater during operation of the project
- Impacts on the Cooks River due to wastewater discharge.

With the implementation of the management measures outlined in **section 21.5** and standard work practices during routine maintenance and repair activities, the overall impact of operational waste for the project would be minimal. The Sustainability Management Plan to be developed as part of the project would outline ways to optimise resource efficiency and waste management during construction and operation of the project and take into account construction staging and specific conditions of approval that may be applied to the project.

### 21.4.4 Cumulative impacts

The operation of other nearby road projects including the New M5 Motorway would require the treatment and discharge of wastewater to the Cooks River. There is the potential for cumulative impacts related to increased wastewater discharged to the Cooks River. The cumulative impact of wastewater discharge on the Cooks River has been assessed in **Chapter 18** (Surface water and flooding).

## 21.5 Management of impacts

**Contingency management of waste**

Contingency measures would be implemented to manage unexpected waste volumes and types of waste materials generated from the construction and operation of the project. Suitable areas would be identified to allow for contingency management of unexpected waste materials, including contaminated materials. These areas would be hardstand or lined areas that are appropriately stabilised and bunded, with sufficient area for stockpile storage and segregation.

Excess spoil would be deposited to spoil management sites within the Sydney Metropolitan area, where feasible. The spoil management sites would have adequate capacity to accept spoil from the project and there is capacity at these sites to accept additional unexpected spoil volumes if required.

In the event of discovery of previously unidentified contaminated material, all relevant work would cease in the vicinity of the discovery and the unidentified contaminated material would be managed in accordance with an unexpected contaminated lands discovery procedure, as outlined in the Guideline for the Management of Contamination[2].

[2] Guideline for the Management of Contamination (Roads and Maritime 2013)

The environmental management measures outlined in **Table 21-9** would be consistently implemented in the event of unexpected waste volumes and materials generated from the construction and operation of the project, along with adherence to all waste principles and relevant legislation and regulations.

## Environmental management measures

Waste can be managed and mitigated through the development of construction and operational management plans and implementation of standard approaches to waste management. Measures to avoid, minimise or manage waste streams generated as a result of the project are detailed in **Table 21-9** and would ensure that all wastes generated during the construction and operation of the project are effectively stored, handled, treated, reused, recycled and/or disposed of in accordance with applicable legislation and guidelines, and in a manner that protects human health and environmental values.

**Table 21-9 Environmental management measures - waste**

| Impact | Reference | Environmental Management Measures | Timing |
|---|---|---|---|
| Waste generation and disposal | W1 | A Construction Waste Management Plan will be prepared for the project prior to construction and will detail appropriate waste management procedures.<br>The CWMP will:<br>• Document expected waste types and volumes for the project<br>• Describe procedures for managing office and project waste materials including separation, treatment and disposal in accordance with relevant guidelines<br>• Detail waste reporting requirements including the implementation of a waste register<br>• Detail the process for identifying waste re-use sites including approval requirements. | Prior to construction |
| | W2 | A Spoil Management Plan will be prepared for the project. The plan will detail spoil management measures including spoil haulage routes and spoil disposal sites. | Prior to construction |
| Large volumes of spoil directed to landfill due to inadequate recycling and reuse | W3 | The project will target the reuse or recycling of 95 percent of uncontaminated spoil generated for beneficial purposes in accordance with the project spoil management hierarchy. | Construction |
| Unexpected waste volumes and types during construction | W4 | Suitable areas will be identified to allow for contingency management of unexpected waste materials, including contaminated materials. Suitable areas will be required to be hardstand or lined areas that are appropriately stabilised and bunded, with sufficient area for stockpile storage. | Construction |

## 21.6 Environmental risk analysis

An Environmental risk analysis was undertaken for waste management (refer to **Table 21-10**).

A level of assessment was undertaken commensurate with the potential degree of impact the project may have on that issue. This included an assessment of whether the identified impacts could be avoided or minimised (for example, through design amendments). Where impacts could not be avoided, environmental management measures have been recommended to manage impacts to acceptable levels.

The residual risk is the risk of the environmental impact after the proposed mitigation measures have been implemented. The methodology used for the environmental risk analysis is outlined in **Appendix O** (Methodologies).

**Table 21-10 Environmental risk analysis – waste**

| Summary of impact | Construction/ operation | Management and mitigation references | Likelihood | Consequence | Residual risk |
|---|---|---|---|---|---|
| Generation of large quantities of excess spoil due to tunnelling that cannot be reused in the project or adjacent projects | Construction | W1, W2, W3 | Certain | Minor | Medium. These level items would be further reviewed during the detailed design development and where necessary additional measures implemented to ensure these risks are suitably mitigated. |
| Impacts associated with poor waste management during construction | Construction | W1 | Likely | Moderate | Low |
| Impacts associated with unexpected waste volumes or types during construction | Construction | W1 | Unlikely | Minor | Low |