

# Site 6 PFAS & Contamination Management Plan

Rev 1  
April 2019

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Aspect	Detail
EPBC Number	EPBC 2017/8023
Proponent	Perth Airport Pty Ltd
Project Name	Site 6: Large Format Retail Outlet
Proponent ACN/ABN	24 077 153 130
Approved Activity	Construction and operation of a large format retail outlet within the Perth Airport estate
Location of Activity	Site 6, Dunreath Drive, Perth Airport, Western Australia
Date of Plan	Approved 18 April 2019

Revision Number	Date	Revised By	Approved By	Reasons & details of changes	Next Review Date
0	10/01/2019	Perth Airport	Environment and Sustainability Manager	First draft for comment	
1	09/04/2019	Perth Airport	Environment and Sustainability Manager	Regulator comments	



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# Site 6 PFAS and Contamination Management Plan





# 1. Introduction

## 1.1 BACKGROUND

A large format retail outlet is planned to be constructed and operated on an area of land referred to as Site 6, located within the Airport West Precinct of the Perth Airport estate.

In accordance with the *Airports Act 1996* (Cth), a Major Development Plan (MDP) for the Site 6: Large Format Retail Outlet was approved by the Federal Minister for Infrastructure, Transport and Regional Development on 13 November 2018. The MDP Conditions of Ministerial Approval require a management plan for per- and poly-fluoroalkyl substances (PFAS) to be approved by the Minister for the Environment prior to works commencing on the Site 6 project.

This PFAS and Contamination Management Plan (PCMP) has been prepared to describe how disturbance of PFAS and other contamination during development activities will be managed in accordance with relevant guidance and legislation.

The consistency of this PCMP with the relevant MDP Conditions of Ministerial Approval is provided at Appendix A.

## 1.2 APPLICATION OF THE PLAN

All works conducted during the development of Site 6 will be subject to the controls and measures described in this PCMP.

This PCMP will form part of each successful contractor's Construction Environment Management Plan (CEMP) that is reviewed by Perth Airport and the Airport Building Controller and/or Airport Environment Officer (appointed by the Department of Infrastructure, Regional Development and Cities) as part of the building approvals required under the *Airports Act 1996* and the *Airports (Building Control) Regulations 1996*.

## 1.3 PLAN CONFORMANCE TO RELEVANT GUIDELINES

The PCMP has been prepared to meet the requirements of the:

- National Environment Protection (Assessment of Site Contamination) Measure 1999, National Environment Protection Council, as varied 2013,
- Environmental Management Plan Guidelines, Department of the Environment, 2014, and
- PFAS National Environmental Management Plan, Heads of Environmental Protection Agencies Australia and New Zealand (HEPA), January 2018.

Appendix B provides checklists demonstrating consistency of this PCMP with each requirement.

## 1.4 REFERENCED DOCUMENTS

A Preliminary Site Investigation (PSI) (JBS&G, 2018) was completed by JBS&G Australia Pty Ltd in November 2018 to provide a current assessment of the nature and extent of potential contamination at Site 6.

This PCMP also relies on the approved MDP (Perth Airport, 2018) for the Site 6 project.

Perth Airport publishes a range of environmental management guidelines and procedures for tenants and contractors at [perthairport.com.au/tenant-and-contractor-environment-management](http://perthairport.com.au/tenant-and-contractor-environment-management). The key documents to be applied in conjunction with this PCMP are:

- Environmental Management Plan Guidelines (PAPL-ENV-GDL-001),
- Fill Material Management Guideline (PAPL-ENV-GDL-006), and
- Fill Material Use Form (PAPL-ENV-FOR-001).



## 2. Project Description

### 2.1 SITE IDENTIFICATION

The Perth Airport estate consists of 2,105 hectares which is owned by the Commonwealth of Australia. Perth Airport has been managed and operated by Perth Airport Pty Ltd since 1 July 1997.

As shown in Figure 2-1, Site 6 is located adjacent to the western boundary of the Perth Airport estate.

Site identification details are provided in Table 2-1.

**Table 2-1 Site Identification Details**

Registered Owner	Commonwealth of Australia
Occupier	Perth Airport Pty Ltd
Street Address	Dunreath Drive, Perth Airport, WA
Lot and Plan/Figure	Part of Lot 100 on Plan 6619
Certificate of Title	Volume 2124 Folio 980
Approximate Site Coordinates	North east corner, -31.939808, 115.951817 North west corner, -31.941073, 115.949704 Eastern corner, -31.941784, 115.952364 Southern corner, -31.943067, 115.951216
Site Area	7.09 hectares
Previous Use	Vacant bushland
Current Use	Vacant bushland
Proposed Use	Commercial/industrial development (including warehouse, associated car parking and service station)



Figure 2-1 Location of Site 6 within the Perth Airport estate  
Source: Major Development Plan for Site 6: Large Format Retail Outlet





## 2.2 ENVIRONMENTAL SETTING

### 2.2.1 Site Layout

Site 6 comprises 7.09 hectares of land, with approximately 48 per cent previously disturbed by clearing, drainage or other development activities. The remaining land contains vegetation ranging in quality from completely degraded to excellent.

The Site 6 boundary is shown in Figure 2-2.



Figure 2-2 Site 6 Boundary

Source: Major Development Plan for Site 6: Large Format Retail Outlet

### 2.2.2 Surrounding Land Use

Site 6 is located close to the western boundary of the Perth Airport estate, to the southwest of Terminal 3 and Terminal 4, and between Tonkin Highway and Dunreath Drive.

The current land use of adjacent properties and the broader airport estate includes:

- North – Boud Avenue, Direct Factory Outlet (DFO), other commercial/industrial land use,
- East – Dunreath Drive, commercial/industrial properties,
- South – Dunreath Drive, cleared and vegetated vacant land, and
- West – Infrastructure (Southern Main Drain), vacant land and Tonkin Highway.



The surrounding suburb of Redcliffe (within the City of Belmont) to the west and north west of the site is presently characterised by low density residential development but will transition towards a Transit Orientated Development mix of commercial and higher density residential land use surrounding the Redcliffe Train Station.

### 2.2.3 Topography

Surface levels within Site 6 (excluding the drainage channels) are between 17.5 metres Australian Height Datum (AHD) in the southwest portion of the site, to approximately 13 metres AHD in the north east portion of the site.

### 2.2.4 Hydrology

All surface water networks throughout the airport estate collect and direct runoff (and through-flowing water) from east to west, towards the Swan River. An extensive network of surface water features exists across the estate, including seasonal and perennial wetland features and both natural and engineered open-channel networks. These features variously intersect shallow groundwater levels and provide functional drainage of shallow ground profiles across the estate. As a result, the main drains contain surface water flows throughout the majority of the year and can behave as 'losing' or 'gaining' waterways in response to complex and seasonally variable interactions between groundwater and surface water (as occurs generally within low-lying sections of the Swan Coastal Plain).

Site 6 is within the catchment for Perth Airport's Southern Main Drain (SMD), which historically flowed through the site and has recently been realigned adjacent to the western and southern site boundaries. The SMD is an open unlined channel for most of its length through the airport estate, but flows through several culverts across the estate, including a 1200mm culvert beneath the southern end of the main runway. Crumpet Creek enters the eastern boundary of the estate and becomes the SMD. The SMD channel then collects runoff from the Airport South Precinct, the southern half of the airfield (runway and taxiway) network, most of the drainage from Airport West Precinct and some flows from the Tonkin Highway. The SMD exits the airport estate at Brearley Avenue into a reserve which drains into the Swan River. The Water Corporation manages both the upstream Crumpet Creek and the downstream reaches of the SMD between the airport and the Swan River.

A section of the SMD is planned to be piped as part of the Site 6 development works, minimising future hydraulic interactions between groundwater and the SMD at this location.

### 2.2.5 Geology

The Geological Survey of Western Australia 1,250,000 geological series map for Perth indicates the airport estate is located on unconsolidated sediments of the (Pleistocene) Bassendean Sands deposit, which are underlain by the sandy-silts and clays of the Guildford Formation. Low lying areas within the Swan Coastal Plain are also known to contain near-surface deposits of peaty clay or swampy deposits, as a result of the coastal and alluvial geomorphology.

Bassendean Sands typically consist of light grey, fine to medium grained sub-rounded quartz sand which is moderately sorted. An iron-cemented layer of ferricrete rock (locally called coffee rock) is commonly encountered at water table depths within Bassendean Sand deposits. Guildford Formation deposits generally consist of mostly brown silty and slightly sandy clays, with interbedded lenses of fine to coarse grain poorly sorted sand.

The combined superficial deposits of the Bassendean Sands and Guildford Formation are mapped to be approximately 30 metres thick in the area of Site 6 and are underlain by siltstone and shale of the Kings Park Formation.

### 2.2.6 Acid Sulfate Soils

The ASRIS Atlas of Australian Acid Sulfate Soils indicates that Site 6 is regarded as having extremely low probability of Acid Sulfate Soils (ASS) occurrence. However, the Site 6 PSI (JBS&G, 2018) reports several areas within nearby locations of the airport estate that are regarded as having a high probability of ASS



occurrence. These areas generally coincide with small areas located in low lying wetland and dune swales. Site-specific intrusive investigations have confirmed ASS at discrete locations within Site 6.

### 2.2.7 Hydrogeology

The airport estate is underlain by the superficial (shallow) aquifer, which is unconfined and occurs within the Bassendean Sand and/or Guildford Formation soils. The superficial aquifer was reported to be approximately 30 metres thick in the region.

Bassendean Sand sediments in the area are relatively permeable with hydraulic conductivities of 5 to 10 metres per day. The silt and clay dominant Guildford Formation is typically less permeable, with an average hydraulic conductivity of 3.3 metres per day.

The seasonally influenced superficial aquifer forms within the high permeability Bassendean Sands in response to infiltrating rainfall. The higher clay content of the underlying Guildford Formation limits vertical percolation, resulting in saturation of the overlying sand. The WA Department of Water Groundwater Atlas indicates that groundwater regionally flows from the southeast to the northwest across the airport estate, towards the Swan River.

Rates of recharge and lateral hydraulic conductivity within the Guildford Formation are highly variable due to the range of lithology presented within the unit. The existence of high permeability sands and low permeability clays within the Guildford Formation can also contribute to localised areas of semi-confined aquifer condition. WA Department of Water information suggests that groundwater gradients are oriented in a more westerly flow direction within the Guildford Formation, again falling towards the Swan River.

The online Groundwater Atlas identifies that groundwater beneath Site 6 is at approximately 5.8 metres below ground level and indicates groundwater flow as being generally to the north.

Site 6 is not located within, or in close proximity of, a Public Drinking Water Source Area (PDWSA)<sup>1</sup>.

The Perth Groundwater Atlas indicates groundwater total dissolved solids concentrations would be in the range of 500 - 1000 mg/L at Site 6.

## 2.3 CONTAMINATION STATUS

An overview of the contamination status of the Perth Airport estate and Site 6 is provided below. A detailed Conceptual Site Model (CSM) developed for Site 6 is presented in Section 8.

### 2.3.1 Perth Airport estate

The Site 6 PSI (JBS&G, 2018) identifies that majority of known contaminated sites within the airport estate are cross-gradient, down-hydraulic gradient or a significant distance up-gradient from Site 6. Key sites within the airport estate are listed below.

Relevant to Site 6:

- Airservices Australia – Aqueous Fire Fighting Foams contamination associated with historic firefighting training and other activities, and
- Gateway WA Project – inert wastes including asbestos detected during construction works near the runway.

Not relevant to Site 6:

- Former Shell Service Station (Brearley Avenue) – hydrocarbons in soil and groundwater,
- Joint Operations Fuel Storage Facility (Miller Road) – phase separated hydrocarbons associated with degraded diesel,
- T1/T2 Car Park construction (Horrie Miller Drive and Hudswell Road) – asbestos contained within older infrastructure,

<sup>1</sup> Public Drinking Water Source Areas (DOW-007) layer from nationalmap.gov.au accessed 07/11/2018





- Helicopters NZ Australia (Airside, General Aviation) – residual soil and groundwater contamination from a jet fuel spill,
- McComb Road Fuel Facility (McComb Road) – hydrocarbons in soil and groundwater,
- Perth Mint Gold Refinery (Horrie Miller Drive) – potential heavy metal contamination in groundwater, and
- Qantas Underground Fuel Tanks (Airside, Domestic and International Terminals) – potential hydrocarbon contamination in fuel storage areas.

The Site 6 PSI (JBS&G, 2018) identifies multiple areas that may have been impacted by historical Aqueous Fire Fighting Foams use within the estate. The areas where Aqueous Fire Fighting Foams use was identified are:

- Fuels and Aqueous Fire Fighting Foams were used at the Fire Training Ground in training exercises. Previous investigations confirmed total recoverable hydrocarbons, polycyclic aromatic hydrocarbons, Perfluorooctane Sulfonate (PFOS) and Perfluorooctanoic Acid (PFOA) were present in surface soils at the Fire Training Ground.
- Aqueous Fire Fighting Foams was stored at the former Aviation Rescue and Fire Fighting fire station. Investigations prior to the demolition of the former fire station area in 2010 identified PFAS in soils and concrete. Demolition and remediation work wastes from that project remain stored in sealed stockpiles within the Airport North Precinct.
- PFAS was also confirmed in groundwater in the vicinity of the former Workshop and Tyre Store located in the Airport West commercial/industrial precinct, west of the Terminal 3 / Terminal 4 complex.
- PFAS was identified in soil, concrete, sediment and surface water across various other locations, confirming a relatively widespread distribution of PFAS across the estate.

Figure 2-3 presents areas of identified historic PFAS use within the Perth Airport estate.

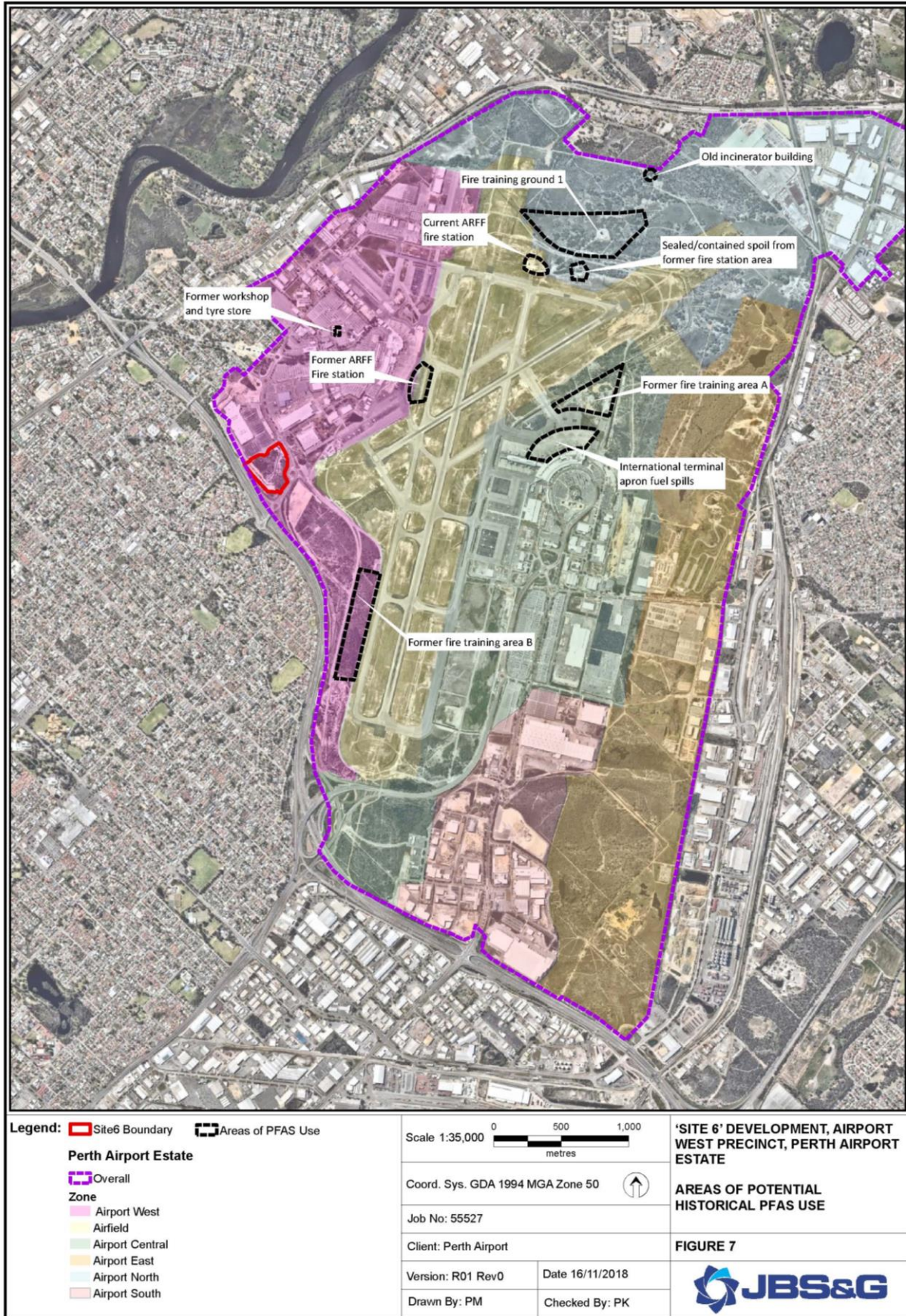


Figure 2-3 Areas of historical potential PFAS use within the Perth Airport estate  
 Source: Site 6 Preliminary Site Investigation (JBS&G, 2018)





### 2.3.2 Perth Airport PFAS Management

Perth Airport is committed to the appropriate assessment, management and remediation of PFAS on the airport estate to ensure the safety of people and communities, protection of the environment and to leave a positive legacy for the future. Perth Airport recognises consideration of holistic and multi-disciplinary approaches to achieve its PFAS management objective, as identified in Figure 2-4 below.

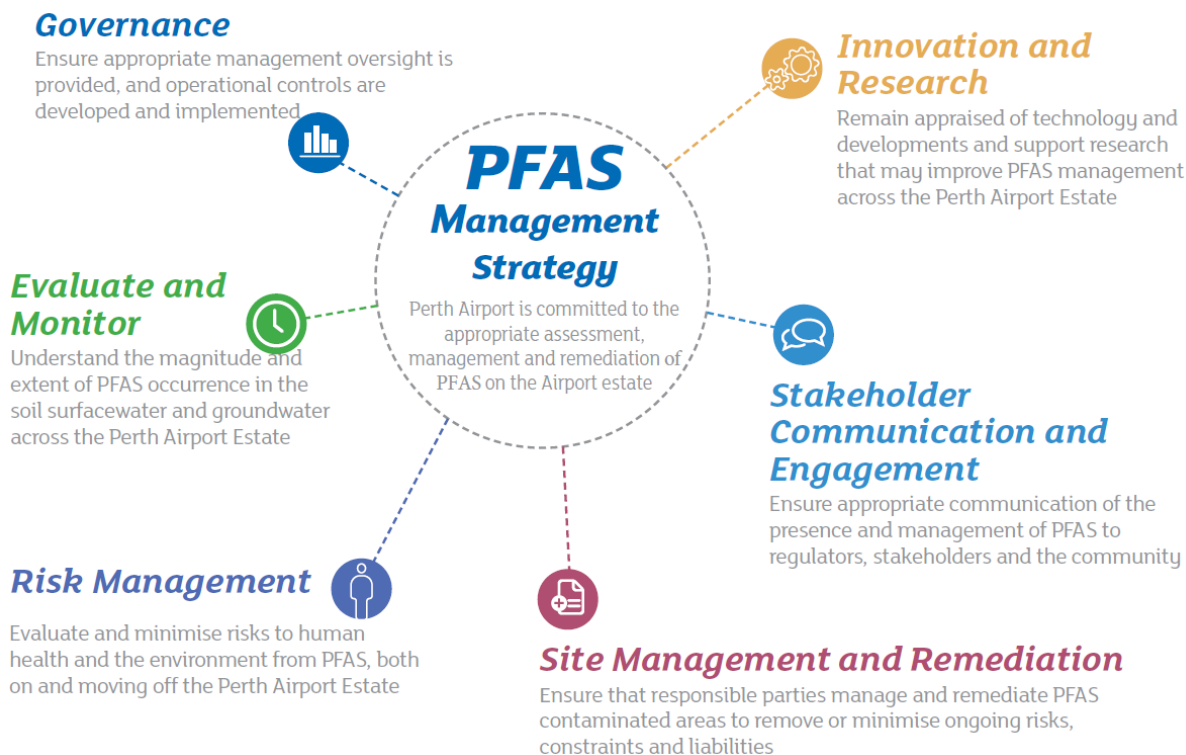


Figure 2-4 Perth Airport PFAS Management Strategy

Source: Perth Airport

This PCMP supports Perth Airport’s PFAS Management Strategy and its PFAS management commitments in relation to the Site 6 development.

### 2.3.3 Site 6

The Site 6 PSI (JBS&G, 2018) concluded that the site was not a primary source of PFAS contamination and was suitable for the proposed commercial/industrial land use (in the context of contamination status), subject to the implementation of relevant management plans. The management plans being implemented for the Site 6 development include:

- to manage the potential exposure of onsite construction/maintenance workers during development to contaminated soil and groundwater (including PFAS contaminated soil and groundwater), and previously unidentified fly-tipping, a Construction Environmental Management Plan (CEMP) will be developed by each relevant contractor and will a PFAS and Contamination Management Plan (PCMP, this document). Environmental Management Plan Guidelines (PAPL-ENV-GDL-001) are published by Perth Airport (at perthairport.com.au/tenant-and-contractor-environment-management) to provide guidance on the content and format of the plan. The CEMP is reviewed by the Airport Building Controller and Airport Environment Officer (employed by the Department of Infrastructure, Regional Development and Cities (DIRDC)) and approved by Perth Airport as part of the Commonwealth’s airport development approvals processes,



- as the presence of ASS is likely in some areas of Site 6, an Acid Sulfate Soil Management Plan (ASSMP) will be developed by each relevant contractor to manage ground disturbance activities at the site (including dewatering), and
- to manage the potential exposure of post-development onsite construction/maintenance workers to contaminated soil and groundwater (including PFAS contaminated soil and groundwater), the ongoing site management (which includes restriction on the abstraction of groundwater unless assessed prior to abstraction as suitable for the proposed beneficial use via appropriate analytical assessment) will be detailed in the Operational Environment Management Plan (OEMP) prepared by the operating tenant and approved by Perth Airport.

## 2.4 PROPOSED DEVELOPMENT

The MDP describes the Site 6 development as comprising:

- Clearing, site preparation and associated earthworks, including the piping of approximately 280 metres of the Southern Main Drain (SMD),
- Building of approximately 14,000 square meters Net Leasable Area (NLA), incorporating retail sales and specialty services,
- Fully automated fuel service station and associated above and underground infrastructure,
- At-grade car parking, and
- Access for private and service vehicles from Boud Avenue and Dunreath Drive.

The Site 6 construction activities are expected to take approximately 12 months and include:

- Fauna trapping and relocation,
- Vegetation clearing and topsoil stripping (approximately 100mm depth),
- Survey and setting out of the site,
- Contractor/s site mobilisation including haulage access, site accommodation and temporary services,
- General bulk earthworks including cut to fill, import of fill (approximately 15,000 m<sup>3</sup>), profiling, batters and retaining works,
- Excavations for fuel tanks (approximately 3,500 m<sup>3</sup>), building foundations and in ground services e.g. sewer, electrical, communications etc,
- Foundation works and fuel system installation,
- Civil works including car park base,
- Building superstructure primary steel work and construction,
- Car park finishes, curbing and landscaping,
- Building fit out, and
- Commissioning and handover.



## 3. Objectives

The objectives of this PCMP are to:

- Ensure that the presence of PFAS is appropriately assessed and evaluated prior to Site 6 development activities,
- Ensure risks from PFAS and contamination to human health and the environment during construction and operation of the proposal are assessed, avoided and appropriately managed,
- Ensure works do not significantly exacerbate existing site conditions with regard to PFAS and contamination and do not significantly increase existing risks,
- Document how disturbance of contamination (particularly PFAS contamination) during development activities will be managed in accordance with relevant guidance and legislation, and
- Provide management, mitigation and monitoring measures to be implemented during Site 6 works to ensure that development activities do not result in unacceptable risk to human health, the environment, environmental values, or deterioration of environmental conditions at, or in the vicinity of, the project area.



## 4. Environmental Management Roles and Responsibilities

Perth Airport is responsible for the ongoing environmental management of the airport estate and project activities. Perth Airport employees and employees of the successful contractors (and any sub-contractors) are responsible for the environmental performance of their activities and must demonstrate compliance with the procedures and commitments identified in this PCMP.

Key personnel with specific environmental management responsibilities are presented in Table 4-1.

**Table 4-1 Roles and Responsibilities**

Role	Responsibilities
Perth Airport Chief Executive Officer	<ul style="list-style-type: none"> <li>Corporate environmental policies and strategies.</li> </ul>
Perth Airport Chief Officers and General Managers	<ul style="list-style-type: none"> <li>Fostering a partnership with key contractors and stakeholders that promoted compliance with Perth Airport's environmental responsibilities and commitments.</li> <li>Ensuring management and monitoring practices and procedures are documented and clearly communicated within the organisation.</li> <li>Provision of appropriate resources to fulfil Perth Airport and regulatory requirements for this project.</li> </ul>
Perth Airport Environment and Sustainability Manager	<ul style="list-style-type: none"> <li>Review and approval of contractor environmental management documents.</li> <li>Assurance (including auditing) of project implementation to ensure compliance with Perth Airport and regulatory requirements.</li> </ul>
Perth Airport Project Manager	<ul style="list-style-type: none"> <li>Communication of Perth Airport, regulatory and approvals environmental requirements to the principal contractor and all personnel conducting works on the project.</li> <li>On-ground oversight and management to ensure compliance with the requirements of this PCMP.</li> </ul>
Principal Contractor/s	<ul style="list-style-type: none"> <li>Development and implementation of a CEMP.</li> <li>Development and implementation of a ASSMP.</li> <li>Implementation of this PCMP.</li> <li>Development of operational procedures and practices relevant to the environment.</li> <li>Coordinating incident response.</li> <li>Reporting and compliance related issues.</li> </ul>
All Site and Field Personnel	<ul style="list-style-type: none"> <li>Reporting and compliance related issues.</li> <li>Training in an implementing procedure, including those that address environmental management at a site or operational level.</li> <li>Carrying out specific activities in accordance with the CEMP and this PCMP.</li> </ul>



# 5. Reporting

## 5.1 ENVIRONMENTAL PROGRESS REPORTING

A monthly environment report will be prepared by the relevant contractor/s and submitted to Perth Airport, providing details of:

- Works currently in progress, highlighting critical activities,
- Work activities to commence in the following month,
- Environmental performance and required follow-up actions (where relevant),
- Results of any sampling conducted during the month as required by this PCMP,
- Current Material Tracking System (with appropriate supporting documents),
- Documentation of environmental incidents, including summary of investigation reports, actions completed and pending actions,
- Summary of daily and weekly inspections, and
- Audits conducted during the reporting month.

## 5.2 INCIDENT REPORTING AND INVESTIGATION

The environmental incident reporting for PFAS and contamination issues will be detailed in the contractor's CEMP. Environmental Management Plan Guidelines are published by Perth Airport (at [perthairport.com.au/tenant-and-contractor-environment-management](http://perthairport.com.au/tenant-and-contractor-environment-management)) to provide guidance on the content and format of the plan. The Perth Airport Environmental Management Plan Guidelines require the contractor's CEMP to include:

- The types of incidents/ complaints that are reported,
- How incidents/complaints are categorised and the severity determined,
- How incidents/complaints are investigated,
- The process for informing Perth Airport of incidents and the person responsible for notification of the following:
  - › When the relevant environmental monitoring objectives and standards have not been met,
  - › Complaints received from the community or a regulator, and
  - › When activities on the premises change or the environmental risk profile of those activities change.

Where any results of environmental monitoring indicate that pollution is occurring, or an environmental trigger level has been reached, the contractor is required to inform the Perth Airport Environment and Sustainability Manager in writing as soon as practicable and in all cases within 24 hours of this information becoming known.

Perth Airport will record and investigate all incidents, observations and/or hazards through its incident reporting and investigation software. Following investigation, relevant corrective actions are issued, and risk assessment/s and associated controls will be updated as required.

A summary of environmental incidents and complaints is prepared by Perth Airport and presented monthly to the DIRDC Airport Environment Officer and annually to DIRDC through the Annual Environment Report obligations under the *Airports Act 1996* and *Airports (Environment Protection) Regulations 1997*.





## 6. Environmental Training

Environmental awareness inductions and training appropriate to the type of work being performed will be provided to all employees, contractors, sub-contractors and site visitors.

The specific inductions and training to be implemented will be detailed in the contractor's CEMP and will include PFAS and contamination. The Perth Airport Environmental Management Plan Guidelines require the contractor's CEMP to detail:

- Processes that demonstrate contractor personnel are appropriately trained and competent to undertake tasks that may potentially impact on the environment,
- The process by which environmental training needs are identified,
- Environmental or HSE training to be provided, including environmental induction and any relevant specialised environmental management training, and
- How training is planned and implemented and what records of training are maintained.

Additionally, the Site 6 contractor's training and induction will be required to include specific information and guidance to its employees and sub-contractors on:

- Management of PFAS and contamination in accordance with this PCMP, and
- Health and environmental controls with regard to PFAS and contamination.



# 7. Emergency Contacts and Procedures

## 7.1 EMERGENCY RESPONSE

The Environmental Management Plan Guidelines published by Perth Airport require the contractor's CEMP to:

- Identify potential emergency situations which may arise, based on previous incidents or experience and through risk assessment,
- Include information on how emergency situations are identified and the management practices to be applied in the case of their realisation,
- Specify requirements for emergency response planning, training and emergency exercises. Perth Airport recommends site emergency response plans which encompass environmental emergencies are developed and referenced in the CEMP, and
- Include key contractor emergency response contacts and detail how Perth Airport personnel are to be integrated into emergency response.

## 7.2 INCIDENT RESPONSE

The Environmental Management Plan Guidelines published by Perth Airport require the contractor's CEMP to include the following incident reporting requirements:

- Inform the Perth Airport Environment and Sustainability Manager in writing as soon as reasonably practicable and in all cases within 24 hours:
  - › Where any results of environmental monitoring indicate that pollution is occurring, or an environmental trigger level has been reached, and
  - › All significant environmental incidents or complaints, notifiable environmental incidents or any other environmental incidents which have the potential to cause environmental impacts external to the facility boundary, or which may result in pollution as described in the Airports (Environment Protection) Regulations 1997.



# 8. Conceptual Site Model

## 8.1 INTRODUCTION

For a potential contamination risk to be present at a site, a complete exposure pathway must exist which consists of a:

- Contaminant source (e.g. primary sources such as leaking chemical tanks, secondary sources such as impacted soils/groundwater/surface water),
- Transport mechanism (pathway) between the source and the receptor (e.g. direct dermal contact with soil/dust/water, inhalation of vapours, migration of groundwater through aquifer matrix),
- Exposure point, where a receptor comes into contact with the contamination, and
- Exposure route (i.e. inhalation, ingestion or dermal).

A risk assessment of exposure pathways identified in this CSM is presented in Section 9.

## 8.2 SOURCES

A review of historical investigations and supplementary information indicated a number of potential source areas relevant to Site 6, as summarised below and depicted in Figure 8-1.

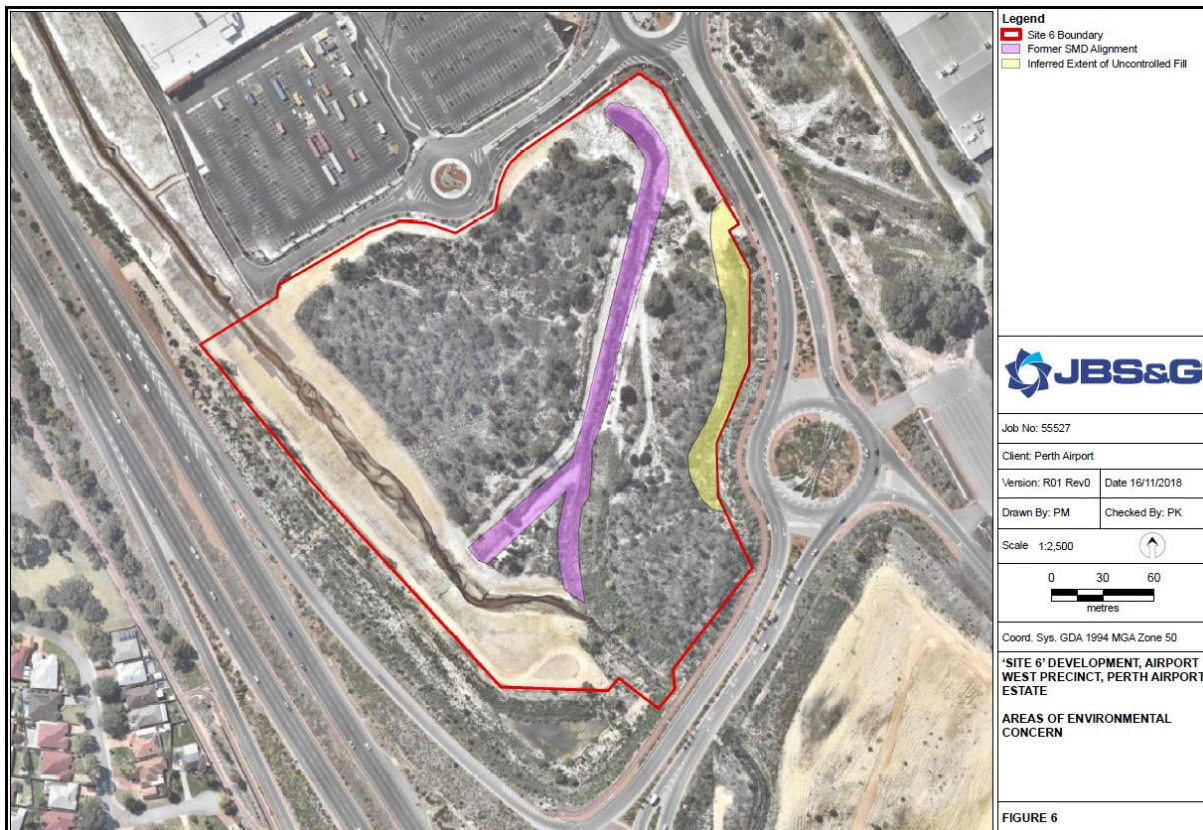


Figure 8-1 Areas of Environmental Concern within Site 6  
 Source: Site 6 Preliminary Site Investigation (JBS&G, 2018)

### 8.2.1 Areas of Historical Uncontrolled Filling

An area of historical uncontrolled filling is located in the south eastern portion of the site. Although the nature and extent of the fill materials have not been delineated, observations at test pit TP102 (see Figure 8-2) (of inclusions of concrete, wood fragments and bituminous gravel) confirm its presence in this area, and the absence of anthropogenic inclusions in fill materials identified in nearby test pits (TP32, TP35 and TP101) indicate that the area is likely to be relatively confined. This is supported by the minimal



encroachment of the clearing activities on the site's boundary, indicated by the historical aerial photograph review.

Concentrations of Chemical of Potential Concern (COPC) were not identified above current assessment criteria in any analysed sample collected from these test pits. However, the widespread presence of PFAS (particularly PFOS) is noted at concentrations above the limit of reporting but below assessment criteria, and are most elevated at location TP102.

The uncontrolled fill is largely located outside the Site 6 boundary, with relatively minor encroachment of the area within Site 6. As such, the sampling results from investigations conducted within adjacent sites have been considered. The results of assessment in adjacent areas indicated that the concentration of asbestos containing materials in the bulk sample collected from the uncontrolled fill profile filling within an adjacent site (0.125% w/w) exceeded the adopted Department of Health (DoH) (2009) criterion of 0.05% w/w for commercial industrial sites, but that soils were not impacted by asbestos fines and/or fibrous asbestos. Another sample collected from within the uncontrolled filling area of the adjacent site reported a fragment of presumed asbestos containing material, and concentrations of zinc and benzo(a)pyrene at concentrations exceeding adopted ecological assessment criteria.

Based on the available information, it is considered that a limited area of uncontrolled filling exists within the south-eastern portion of Site 6, most likely restricted to the immediate vicinity of the eastern boundary. The filling materials have not been fully characterised but may contain concentrations of benzo(a)pyrene and zinc in excess of ecological assessment criteria. The presence of fragments of potentially asbestos containing materials (ACM) is also considered reasonably likely. Although present across the site, concentrations of PFAS are likely to be elevated in this area in comparison to other areas of Site 6.

### 8.2.2 Fly Tipping

Site inspections have not identified fly-tipping within Site 6 but are present within areas in close proximity to Site 6.

It is considered possible that areas of fly-tipping may exist within Site 6 that have not been previously identified or assessed due to the dense vegetation within the site.

### 8.2.3 Drainage Channel Sediments

A review of historical aerial photography indicates that the portion of the SMD present within the site has been realigned on at least two occasions. The MDP identifies that a section of the SMD will be piped as part of the Site 6 works.

It is assumed that sediments within the former alignments of the drainage channel remain in-situ, and the contamination status of these sediments is unknown.

Although sampling of sediments has not been completed within Site 6, the results of sediment sampling completed in close proximity to the site, for the purposes of PFAS assessment, have been considered. PFAS was not identified in the sediments samples within the SMD, and sediment build up at the base of the SMD was reported to be low.

Should sediments remain within the former drainage channel alignments, it is considered that these volumes are likely to be minimal. Based on analysis of sediment samples collected from nearby areas, any sediments present are unlikely to contain PFAS (but have not been assessed for the presence of other COPC).

### 8.2.4 PFAS in Soil within Site 6

Detections of PFAS are present at Site 6, consistent with the widespread presence of PFAS across the Perth Airport estate. The concentrations generally increase with depth where vertical delineation was conducted. The highest concentrations of PFAS identified were associated with the area of uncontrolled filling in the south-east portion of Site 6. Whilst widespread detection of PFAS at low level is noted, concentrations of PFAS were not identified above current assessment criteria in any analysed soil sample from within Site 6. Figure 8-2 provides an overview of historical sampling locations and results.



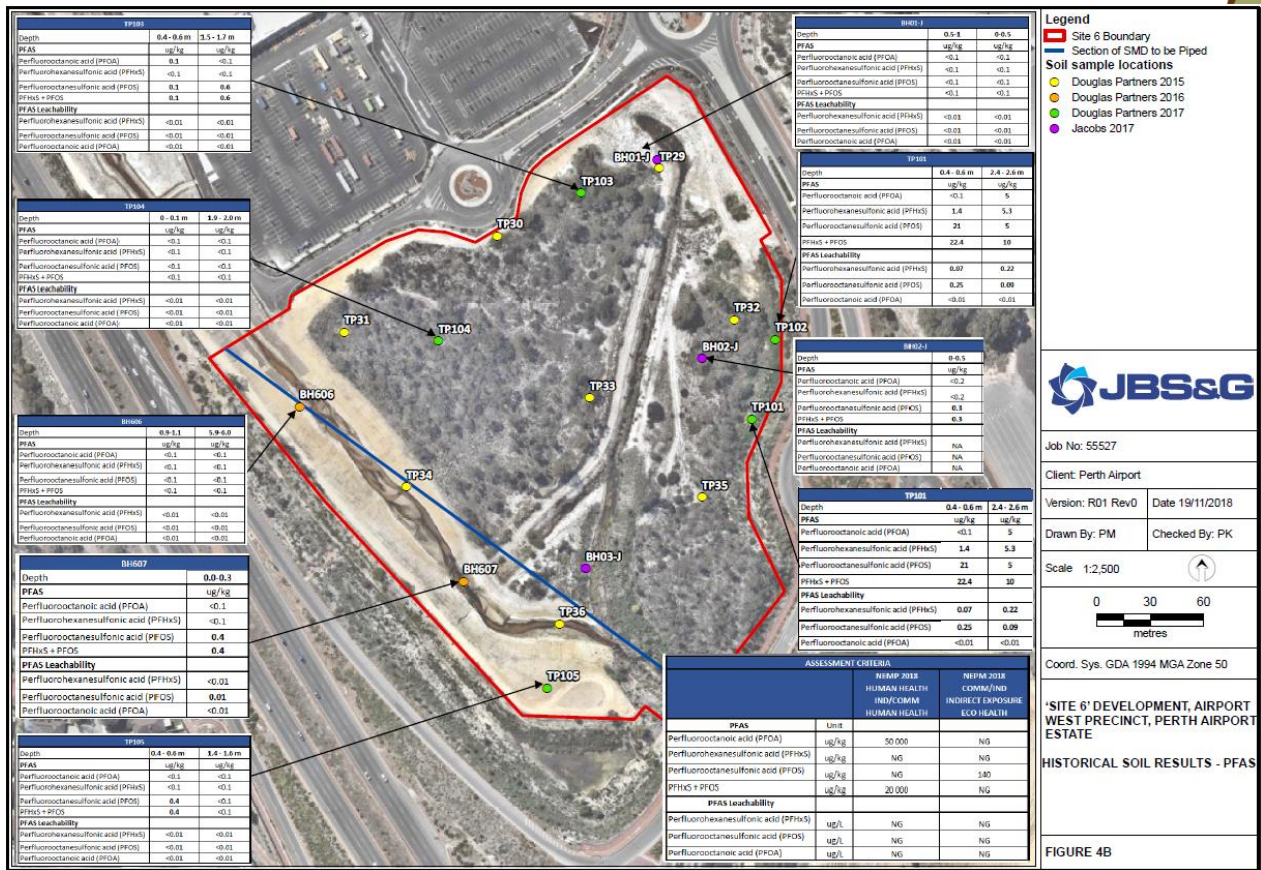


Figure 8-2 Historical PFAS Results (Soil) within Site 6  
Source: Site 6 Preliminary Site Investigation (JBS&G, 2018)

### 8.2.5 Acid Sulfate Soils

Previous ASS investigations provide a general indication of the presence of ASS at Site 6, with ASS likely to be encountered to the east of the planned retail warehouse (at depths exceeding 1 meter) and within the location of the planned underground fuel tanks (at depths exceeding 5 meters below ground level).

### 8.2.6 PFAS in Groundwater beneath Site 6

Concentrations of PFAS have consistently been identified in groundwater beneath the site, during the limited groundwater assessments conducted. Based on the results of the most recent sampling conducted, concentrations of PFOA in groundwater beneath the site do not exceed current human health or ecological criteria, however, concentrations of PFOS exceed 99% freshwater criteria and concentrations of PFHxS+PFOS exceed recreational and drinking water criteria.

The extent of PFAS impacts to groundwater beneath Site 6 has not been delineated. However, the site itself is unlikely to be a significant source of PFAS impact (based on site history), with the groundwater results reported consistent with historical investigative observations of relatively widespread distribution of PFAS across the estate. Figure 8-3 shows an overview of historical groundwater sampling locations and results.

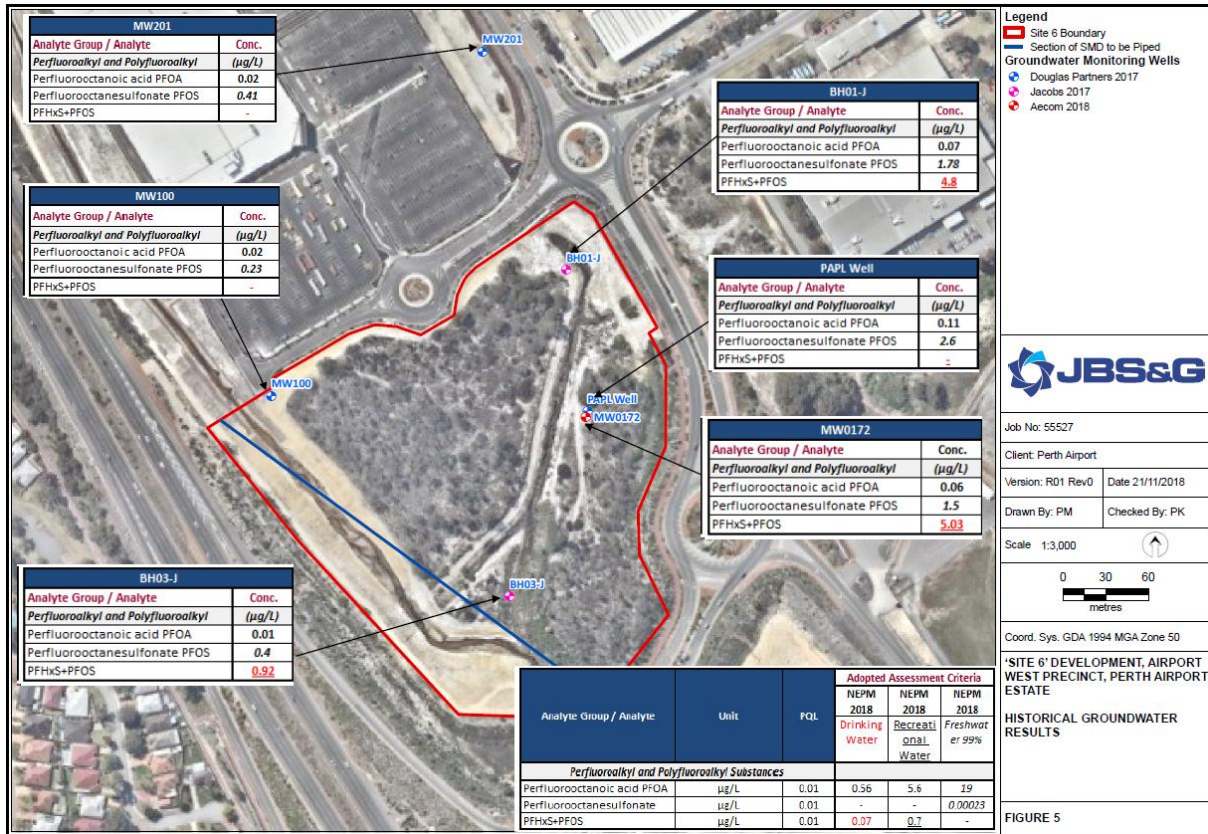


Figure 8-3 Historical PFAS Results (Groundwater) within Site 6  
 Source: Site 6 Preliminary Site Investigation (JBS&G, 2018)

### 8.3 RECEPTORS

Potential receptors relevant to the site that require consideration are summarised below.

#### 8.3.1 Onsite

- Construction and maintenance workers involved in sub-surface works either during development or post-development,
- Commercial/industrial workers post-development,
- Groundwater beneath the site, and
- Terrestrial ecology.

#### 8.3.2 Offsite

- Construction and maintenance workers involved in sub-surface works,
- Recreational users of surface water receptors (including the Swan River),
- Nearby (down hydraulic gradient) users of abstracted groundwater, and
- Groundwater dependent ecosystems, including terrestrial, aquatic and benthic flora and fauna inhabiting down-hydraulic gradient surface water receptors.





## 8.4 TRANSPORT MECHANISMS

### 8.4.1 Drainage Channels

Historical investigations identified that PFAS distribution across the estate may be influenced by the shallow groundwater table and the open channel drainage network. Additionally, some interaction between the groundwater table and the drainage network is possible, which may result in the transport of PFAS. Although this may have historically occurred, the piping of a section of the SMD within Site 6 will locally preclude this interaction within the site and may reduce potential off-site release of PFAS.

Historical investigations do not provide comment on the potential for other COPC to have been transported via this hydraulic interaction. However, it is noted that significant concentrations of COPC other than PFAS have not been identified in groundwater beneath Site 6 or in surface water monitoring within the SMD.

### 8.4.2 Migration through the Soil Profile

Although concentrations of PFAS were not identified in excess of adopted soil assessment criteria, the minor concentrations of PFAS identified at the site may have acted as a minor ongoing potential source to groundwater. This is supported by the relatively higher concentrations of PFAS at depth (where vertical delineation was conducted), and the results of limited historical leachability analysis. The sand dominant geology at the site would also facilitate this downward migration through the unsaturated zone.

It is possible that concentrations of zinc and benzo(a)pyrene may exist within the historical area of uncontrolled fill, which could leach downwards through the soil profile to impact groundwater.

It is noted that the majority of the site is intended to be sealed under building footprints and carpark hardstand, which would have the effect of capping the site and therefore limiting the downward migration of contamination in soil to groundwater.

In the event that ground disturbance activities (including dewatering) are not appropriately controlled during development activities in areas of ASS occurrence, it is possible that the consequent acid generation may mobilise contaminants within the soil profile, which could subsequently impact groundwater quality. Any dewatering will be managed via the ASSMP to reduce acid generation risk.

### 8.4.3 Migration in Groundwater

Significant concentrations of COPC other than PFAS have not been identified in groundwater beneath the site.

Limited groundwater sampling conducted has confirmed the presence of PFAS in groundwater beneath the site at concentrations exceeding relevant ecological and human health criteria. Although minor PFAS concentrations have been identified in soils at Site 6 which could represent a very limited ongoing source of PFAS to groundwater, the primary contributors of PFAS contamination are those source areas identified elsewhere within the Perth Airport estate (e.g. fire training grounds). The extent of the PFAS plume has not been delineated but is acknowledged to be widespread throughout the estate.

### 8.4.4 Windblown Fibres and Dusts

In the event that degraded asbestos containing material fragments are present at the site (within the area of historical uncontrolled filling or associated with potential fly-tipping), free fibres may be transported via the action of wind to impact receptors.

As the site is presently unsealed, the potential exists for the generation of contaminated dust (PFAS and other COPC) during construction activities. However, it is noted that concentrations of COPC were not identified above human health assessment criteria in soils at the site. Once the site is sealed, this transport mechanism will no longer be relevant to the site.

## 8.5 EXPOSURE PATHWAYS

The exposure mechanisms summarised below have been identified as relevant to Site 6. These mechanisms are further discussed in Table 8-1.





### 8.5.1 Onsite

- Dermal contact with soil,
- Dermal contact with abstracted groundwater (including dewatering activities),
- Incidental ingestion of soil,
- Incidental ingestion of abstracted groundwater (including during dewatering activities),
- Inhalation of dust particles,
- Inhalation of asbestos fibres, and
- Direct exposure of terrestrial ecology to soil contamination.

### 8.5.2 Offsite

- Dermal contact with soil,
- Dermal contact with abstracted groundwater,
- Incidental ingestion of soil,
- Incidental ingestion of abstracted groundwater,
- Dermal contact with surface water,
- Incidental ingestion of surface water,
- Consumption of fish and/or shellfish from surface water bodies, and
- Consumption of groundwater for drinking and other domestic uses.



**8.6 POTENTIALLY COMPLETE EXPOSURE SCENARIOS**

Table 8-1 provides a summary of potential receptors, exposure mechanisms and potentially complete exposure scenarios.

**Table 8-1 Preliminary Conceptual Site Model**

Source	Receptor	Exposure mechanism	Pathway likely to be complete?	Comments
<i>Onsite Exposure Scenarios</i>				
<p>Areas of Historical Uncontrolled Filling</p> <p>There is the potential for zinc and benzo(a)pyrene to be present in this area at concentrations exceeding Ecological Investigation Level. Concentrations of PFAS are present but are unlikely to exceed ecological or human health assessment criteria. Fragments of ACM are reasonably likely to be present.</p>	<p>Construction and maintenance workers involved in sub-surface works (either during or post development)</p>	<p>Dermal contact with fill materials. Incidental ingestion of fill materials. Inhalation of dust particles or fibres (asbestos only).</p>	Y	<p>Exposure to potential ACM is to be managed via the PCMP during development, and via an Operational Environment Management Plan (OEMP) post-development. Concentrations of other COPC do not exceed adopted human health assessment criteria. PFAS NEMP guideline values for human health do not consider potential risks to this type of receptor. Management of exposure to PFAS will be required via the PCMP during development, and via an OEMP post-development.</p>
	<p>Commercial/industrial workers and general public at the site post development</p>	<p>Dermal contact with fill materials. Incidental ingestion of fill materials. Inhalation of dust particles or fibres (asbestos only).</p>	N	<p>The majority of the site will be sealed under building footprints and car park hardstand, with minor areas landscaped. The sealed site surface will preclude contact with the fill materials.</p>
	<p>Groundwater beneath the site</p>	<p>Downwards leaching through unsaturated zone to impact groundwater</p>	N	<p>Based on the sampling conducted, any exceedances of guidelines are likely to be isolated and minor. Concentrations of PFAS identified in soil are not indicative of a primary PFAS source and do not exceed ecological assessment criteria. Although it is possible that the minor concentrations of PFAS identified in soil may act as a very limited ongoing source of PFAS to groundwater, the contribution is likely to be negligible when compared to contributions to the contaminant load from other part of the Perth Airport estate. Further, the proposed sealing of the site during development will minimise groundwater infiltration and therefore restrict the occurrence of leaching.</p>



Source	Receptor	Exposure mechanism	Pathway likely to be complete?	Comments
	Terrestrial ecology	Direct exposure to soil contamination.	N	Identified concentrations of PFAS in soil do not exceed adopted assessment criteria. The concentrations of COPC (zinc and Benzo(a)pyrene) exceeding Ecological Investigation Levels identified are relatively minor and likely to be isolated. Ongoing direct exposure to soil contamination by terrestrial ecology will not be possible once the site is sealed during development.
Fly-tipping  It is possible that areas of fly-tipping may exist within Site 6 that have not been previously identified or assessed.	Construction and maintenance workers involved in sub-surface works (either during or post development)	Dermal contact with fly-tipped materials. Incidental ingestion of fly-tipped materials. Inhalation of dust particles or fibres (asbestos only).	Y	Exposure to potential fly-tipped materials will be managed via the Unexpected Finds Procedure (see Appendix D) during site development activities. Fly-tipped materials are to be appropriately disposed of during development and would therefore not be relevant to post-development receptors.
	Commercial/industrial workers and general public at the site post development	Dermal contact with fly-tipped materials. Incidental ingestion of fly-tipped materials. Inhalation of dust particles or fibres (asbestos only).	N	Fly-tipped materials will be appropriately disposed of during development and the proposed sealing and development would further reduce risk, therefore this risk is not relevant to post-development receptors.
	Groundwater beneath the site	Downwards leaching through unsaturated zone to impact groundwater	N	It is unlikely that minor fly-tipping would act as a significant source of groundwater contamination. Fly-tipped materials will be appropriately disposed of during development and would therefore not be relevant to post-development receptors.
	Terrestrial ecology	Direct exposure to soil contamination.	N	It is unlikely that minor fly-tipping would act as a significant source of impact to terrestrial ecology. Fly-tipped materials will be appropriately disposed of during development and would therefore not be relevant to post-development receptors.
Drainage Channel Sediments	Construction and maintenance workers involved in sub-	Dermal contact with sediments.	N	The contaminant status of drainage channel sediments has not been assessed for COPC other than PFAS (which was not



Source	Receptor	Exposure mechanism	Pathway likely to be complete?	Comments
Minor volumes of sediments may be present at the site, associated with former alignments of the SMD. These sediments are unlikely to contain significant concentrations of PFAS but have not been assessed for the presence of other COPC.	surface works (either during or post development)	Incidental ingestion of sediments. Inhalation of dust particles.		identified). However, based on relevant assessments, sediment volume within the historical alignment is likely to be relatively low. Due to the lack of data pertaining to these sediments, potential contact will be managed during construction activities via adherence to the PCMP.
	Commercial/industrial workers and general public at the site post development	Dermal contact with sediments. Incidental ingestion of sediments. Inhalation of dust particles.	N	Post-development, any remnant sediment material would be located at depth. The sealing of the site will preclude contact with sediments.
	Groundwater beneath the site	Downwards leaching through unsaturated zone to impact groundwater	N	The minor sediment volumes likely to remain within the former drainage alignment at the site are unlikely to act as a significant ongoing source of contamination to groundwater. Further, the sealing of the site during development will minimise groundwater infiltration and therefore restrict leachate generation.
	Terrestrial ecology	Direct exposure to sediment contamination.	N	The site will be sealed with hardstand during development, and therefore any contact with terrestrial ecology is likely to be minimal.
PFAS in Soil Concentrations of PFAS in soil at the site do not exceed human or ecological assessment criteria. Leachability testing indicates that the minor concentrations present may be leachable.	Construction and maintenance workers involved in sub-surface works (either during or post development)	Dermal contact with soil. Incidental ingestion of soil. Inhalation of dust particles.	Y	PFAS NEMP guideline values for human health do not consider potential risks to this type of receptor. Management of exposure to PFAS will be required via the PCMP during development, and via an OEMP post-development.
	Commercial/industrial workers and general public at the site post development	Dermal contact with soil. Incidental ingestion of soil. Inhalation of dust particles.	N	The majority of the site will be sealed under building footprints or hardstand. A sealed site surface will preclude contact with the fill materials.
	Groundwater beneath the site	Downwards leaching through unsaturated zone to impact groundwater	N	Concentrations of PFAS identified in soil do not exceed ecological assessment criteria. Although it is possible that the minor concentrations of PFAS identified in soil may act as a very limited ongoing source of



Source	Receptor	Exposure mechanism	Pathway likely to be complete?	Comments
				PFAS to groundwater, the contribution is likely to be negligible when compared to contributions to the contaminant load from other part of the Perth Airport estate. Further, the proposed sealing of the site during development will minimise groundwater infiltration and therefore restrict leachate generation.
	Terrestrial ecology	Direct exposure to soil contamination.	N	Identified concentrations of PFAS in soil do not exceed adopted ecological assessment criteria. Ongoing direct exposure to soil contamination by terrestrial ecology will not be possible once the site is sealed during development.
Acid Sulfate Soils  ASS is present at the site, including in the area east of the proposed warehouse (at depth greater than 1m bgl) and within the proposed location of the underground fuel tanks (at depths greater than 5m bgl).	Construction and maintenance workers involved in sub-surface works (either during or post development)	Dermal contact with acidified materials. Incidental ingestion of acidified materials.	N	Ground disturbance activities with the potential to disturb materials greater than 1m below ground surface will be managed via a suitable ASSMP. Undisturbed ASS is not considered to be contamination.
	Groundwater beneath the site	Acidification of groundwater associated with the oxidation of disturbed ASS.	N	Ground disturbance activities with the potential to disturb materials greater than 1m below ground surface will be managed via a suitable ASSMP. Undisturbed ASS is not considered to be contamination.
	Terrestrial ecology	Direct exposure to acidified materials.	N	Ground disturbance activities with the potential to disturb materials greater than 1m below ground surface will be managed via a suitable ASSMP. Undisturbed ASS is not considered to be contamination.
PFAS in Groundwater  Concentrations of PFAS beneath the site exceed human health and ecological assessment criteria.	Construction and maintenance workers involved in sub-surface works (either during or post development)	Dermal contact with groundwater. Incidental ingestion of groundwater.	Y	Concentrations of PFAS exceed recreational and drinking water criteria. Dewatering activities are likely to be required during development (installation of underground storage tanks), which results in the potential for workers to be exposed to PFAS impacted groundwater. Exposure during development will require management as per the PCMP. Post-development, the depth to groundwater in most areas of the site would preclude contact. However, as an OEMP will be



Source	Receptor	Exposure mechanism	Pathway likely to be complete?	Comments
				required for management of other issues, potential exposure of intrusive maintenance workers to PFAS impacted groundwater during deep excavations should be included as a conservative measure.
	Commercial/industrial workers at the site post development	Dermal contact with groundwater. Incidental ingestion of groundwater.	Y	Concentrations of PFAS exceed recreational and drinking water criteria. Groundwater abstraction at the site should not occur without prior risk assessment to assess suitability for use.
<i>Offsite Exposure Scenarios (outside Site 6)</i>				
<p>PFAS in Groundwater Concentrations of PFAS beneath the site exceed human health and ecological assessment criteria.</p> <p>It should be noted that Site 6 is not considered to be a primary 'source' site with regards to PFAS.</p> <p>Whilst offsite exposure scenarios have been included in the CSM for completeness, they do not require specific management under the PCMP. i.e. the proposed management measures onsite are designed to prevent any deterioration/worsening of current</p>	Construction and maintenance workers involved in sub-surface works	Dermal contact with groundwater. Incidental ingestion of groundwater.	Not assessed	Concentrations of PFAS exceed recreational and drinking water criteria beneath the site and are likely to exceed these criteria in adjacent offsite areas. The depth to groundwater in most areas of the site would preclude contact. However, in areas with particularly shallow groundwater and/or where deep excavations are proposed, exposure will be managed via an appropriate CEMP. Assessment of PFAS in groundwater was restricted to the immediate vicinity of Site 6. As the nature and extent of the PFAS groundwater plume has not been fully characterised, the potential for these exposure scenarios to be complete cannot be assessed.
	Recreational users of surface water receptors	Surface expression or discharge of impacted groundwater within surface water receptors, and subsequent dermal contact, incidental ingestion, and/or consumption of fish and shellfish from these surface water bodies.	Not assessed	Assessment of PFAS in groundwater was restricted to the immediate vicinity of Site 6. As the nature and extent of the PFAS groundwater plume has not been fully characterised, and groundwater/surface water interactions in the region have not been investigated, the potential for these exposure scenarios to be complete is cannot be assessed.
	Nearby (down-hydraulic gradient)	Dermal contact with groundwater.	Not assessed	Assessment of PFAS in groundwater was restricted to the immediate vicinity of Site 6. As the nature and extent of the PFAS groundwater plume has not been fully characterised, the



Source	Receptor	Exposure mechanism	Pathway likely to be complete?	Comments
environmental conditions.	users of abstracted groundwater	Incidental ingestion of groundwater used for non-potable purposes. Consumption of groundwater abstracted for drinking. Consumption of home grown produce irrigated with PFAS impacted water.		potential for these exposure scenarios to be complete cannot be assessed. Within the Perth Airport estate, abstraction of groundwater should be restricted unless environmental monitoring has demonstrated that it is suitable for the proposed beneficial use. Although no registered down-hydraulic gradient bores have been identified in close proximity to the site, groundwater bore registration in WA is not compulsory, and therefore bores may exist which have not been identified. Such bores in offsite locations could be used for non-potable purposes, including the irrigation of home produce. Consumption of abstracted groundwater as drinking water is unlikely as the site and surrounds are connected to a municipal water supply.
	Groundwater dependent ecosystems, including terrestrial, aquatic and benthic flora and fauna inhabiting down-hydraulic gradient surface water receptors.	Surface expression and/or discharge of impacted groundwater within surface water receptors, and subsequent direct contact.	Not assessed	Assessment of PFAS in groundwater was restricted to the immediate vicinity of Site 6. As the nature and extent of the PFAS groundwater plume has not been fully characterised, and groundwater/surface water interactions in the region have not been investigated, the potential for these exposure scenarios to be complete cannot be assessed.





## 9. Potential Environmental Impacts and Risks of Contamination

### 9.1 CONTAMINATION - POTENTIALLY COMPLETE EXPOSURE PATHWAYS

The CSM presented in Section 8 provides a summary of sources, pathways and receptors relating to contamination at Site 6.

Section 9.4 provides a risk assessment of the likelihood and consequence of each of these potential exposure scenarios, in accordance with the methodology for risk assessment presented in the Environmental Management Plan Guidelines (DoE, 2014). The outcomes of the risk assessment will inform what management measures are required to mitigate the identified risks presented by contamination during the development of Site 6.

### 9.2 POTENTIAL IMPACT OF CONTAMINATION TO MATTERS PROTECTED UNDER THE EPBC ACT

While the development of Site 6 will impact on a protected matter (Banksia Woodland of the Swan Coastal Plain), the removal of this habitat is not relevant in the context of the assessment and management of PFAS and contamination issues at Site 6.

### 9.3 POTENTIAL IMPACTS OF CONTAMINATION TO HUMAN HEALTH AND THE ENVIRONMENT

#### 9.3.1 About PFAS

PFAS are part of a large group of perfluoroalkylated compounds consisting of a fully fluorinated hydrophobic alkyl chain of varying length (typically 4 to 16 carbon atoms) and a hydrophilic end group. PFAS are an emerging contaminant of concern because they are now known to be persistent, bio accumulative, toxic and, due to their persistence in the environment and moderate solubility, can be transported significant distances from the source zone, in both water and air. Due to the favourable chemical and physical properties of PFAS, they are commonly used in stain, grease and water-resistant surface treatment products, paints, coatings, cleaning products and firefighting foams (also referred to as Aqueous Fire Fighting Foams).

#### 9.3.2 Summary of Potential Contamination Impacts

Although contamination has been identified within Site 6, it is noted that the concentrations of COPC identified are relatively minor, and isolated in extent. It is considered that Site 6 is suitable for the proposed commercial/industrial development, subject to the implementation of management measures determined to be appropriate based on the outcomes of the risk assessment.

Despite the relatively minor nature of the contamination identified within Site 6, the following potential impacts are acknowledged:

- Contamination or deterioration of current environmental quality of land, surface water and/or groundwater, and
- Human health impacts to construction workers.

Figure 9-1 provides a graphical depiction of the CSM during development activities.

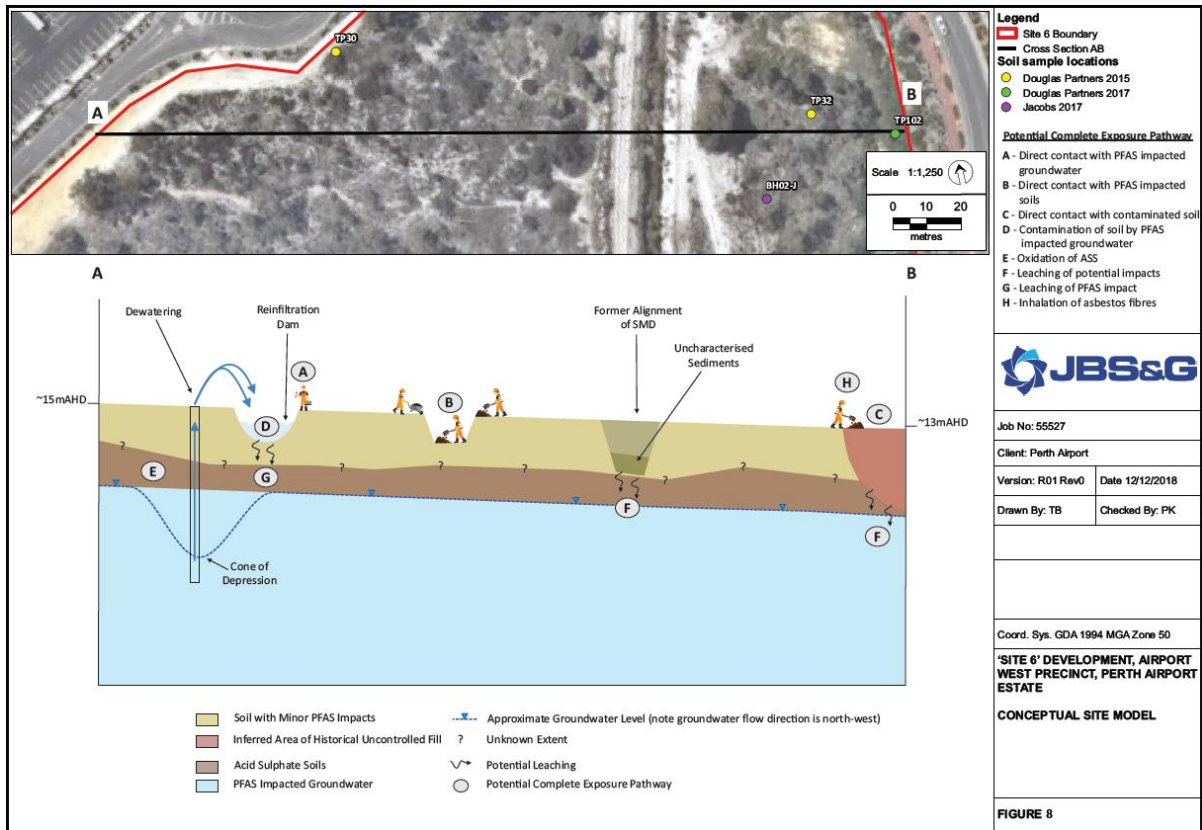


Figure 9-1 Conceptual Site Model (CSM) during Site 6 development

Source: Site 6 Preliminary Site Investigation (JBS&G, 2018)

### 9.4 RISK ASSESSMENT

The following risk assessment considers the likelihood and consequence of each of the potentially complete exposure scenarios identified in the CSM, in accordance with the methodology for risk assessment presented in the Commonwealth’s Environmental Management Plan Guidelines (DoE, 2014). The outcomes of the risk assessment inform the management measures required to mitigate the identified risks presented by contamination during the development of Site 6.

#### 9.4.1 Likelihood and Consequence

Each of the potentially complete exposure scenarios identified in the CSM have been given a rating in terms of likelihood (Table 9-1) and consequence (Table 9-2). These ratings are then combined to generate a risk rating of low, medium, high or severe.

Table 9-1 Likelihood

Source: Environmental Management Plan Guidelines, Department of the Environment 2014

Qualitative measure of likelihood – how likely is it that this event will occur	
Highly likely	Is expected to occur in most circumstances
Likely	Will probably occur during the life of the project
Possible	Might occur during the life of the project
Unlikely	Could occur but considered unlikely or doubtful
Rare	May occur in exceptional circumstances



**Table 9-2 Consequences**

Source: Source: Environmental Management Plan Guidelines, Department of the Environment 2014

Qualitative measure of consequences - what will be the consequence/result if this issue does occur	
Minor	Minor incident of environmental damage that can be reversed
Moderate	Isolated but substantial instances of environmental damage that could be reversed with intensive efforts
High	Substantial instances of environmental damage that could be reversed with intensive efforts
Major	Major loss of environmental amenity and real danger of continuing
Critical	Severe widespread loss of environmental amenity and irrecoverable environmental damage

### 9.4.2 Risk Rating

The risk rating generated using Table 9-3 has been used as a guide to the amount of time and resources that will be required to manage each risk.

**Table 9-3 Risk Rating**

Source: Source: Environmental Management Plan Guidelines, Department of the Environment 2014

	Minor	Moderate	High	Major	Critical
Highly Likely	Medium	High	High	Severe	Severe
Likely	Low	Medium	High	High	Severe
Possible	Low	Medium	Medium	High	Severe
Unlikely	Low	Low	Medium	High	High
Rare	Low	Low	Low	Medium	High



Table 9-4 Risk Assessment for Construction/Development Activities

Aspect	Potential Source	Exposure Pathways	Likelihood	Consequence	Inherent Risk	Required Management Measures	Likelihood	Consequence	Residual Risk
Human Health – onsite construction workers during development	<ul style="list-style-type: none"> <li>• Areas of historical uncontrolled filling</li> <li>• Fly-tipping</li> <li>• Drainage channel sediments</li> <li>• PFAS in soil</li> <li>• PFAS in groundwater</li> </ul>	<ul style="list-style-type: none"> <li>• Dermal contact with fill materials, sediments and/or soil</li> <li>• Incidental ingestion of fill materials, sediment, and/or soil</li> <li>• Inhalation of dust particles or fibres (asbestos only)</li> <li>• Dermal contact with groundwater</li> <li>• Incidental ingestion of groundwater</li> </ul>	Likely	Moderate	Medium	<ul style="list-style-type: none"> <li>• Environmental awareness training</li> <li>• Site inductions</li> <li>• Material Tracking System</li> <li>• Stockpile management</li> <li>• Task-specific Personal Protective Equipment (PPE)</li> <li>• Management of imported/transferred materials</li> <li>• Management of dewatering effluent</li> <li>• Unexpected Finds Procedure</li> <li>• Asbestos Management Procedure</li> </ul>	Rare	Moderate	Low
Environmental Health – groundwater beneath the site	<ul style="list-style-type: none"> <li>• Areas of historical uncontrolled filling</li> <li>• Fly-tipping</li> <li>• Drainage channel sediments</li> <li>• PFAS in soil</li> <li>• PFAS in groundwater</li> <li>• Disturbance of naturally occurring ASS</li> </ul>	<ul style="list-style-type: none"> <li>• Downwards leaching through unsaturated zone to impact groundwater</li> <li>• Acidification of groundwater due to oxidation of disturbed ASS</li> </ul>	Possible	Moderate	Medium	<ul style="list-style-type: none"> <li>• Environmental awareness training</li> <li>• Site inductions</li> <li>• Material Tracking System</li> <li>• Stockpile management</li> <li>• Management of imported/transferred materials</li> <li>• Management of dewatering effluent</li> <li>• Acid Sulfate Soils Management Plan</li> </ul>	Rare	Moderate	Low
Environmental Health – onsite terrestrial ecology	<ul style="list-style-type: none"> <li>• Areas of historical uncontrolled filling</li> <li>• Fly-tipping</li> <li>• Drainage channel sediments</li> <li>• PFAS in soil</li> <li>• PFAS in groundwater</li> <li>• Disturbance of naturally occurring ASS</li> </ul>	<ul style="list-style-type: none"> <li>• Direct exposure to contamination in soil/sediment/fill</li> <li>• Direct exposure to acidified conditions due to oxidation of disturbed ASS</li> </ul>	Possible	Moderate	Medium	<ul style="list-style-type: none"> <li>• Environmental awareness training</li> <li>• Site inductions</li> <li>• Material Tracking System</li> <li>• Stockpile management</li> <li>• Management of imported/transferred materials</li> <li>• Management of dewatering effluent</li> <li>• Unexpected Finds Procedure</li> <li>• Acid Sulfate Soils Management Plan</li> </ul>	Rare	Moderate	Low





Aspect	Potential Source	Exposure Pathways	Likelihood	Consequence	Inherent Risk	Required Management Measures	Likelihood	Consequence	Residual Risk
Environmental Health – offsite environments	<ul style="list-style-type: none"> <li>• Areas of historical uncontrolled filling</li> <li>• Fly-tipping</li> <li>• Drainage channel sediments</li> <li>• PFAS in soil</li> <li>• PFAS in groundwater</li> <li>• Disturbance of naturally occurring ASS</li> </ul>	<ul style="list-style-type: none"> <li>• Acidification of groundwater in the immediate vicinity of the site due to the oxidation of disturbed ASS</li> <li>• Contaminated material carried in runoff from onsite stockpiles</li> <li>• Contaminated material carried in dust from onsite stockpiles</li> <li>• Discharge of PFAS impacted dewatering effluent to offsite area</li> <li>• Surface expression and/or discharge of PFAS impacted groundwater within surface water receptors, and subsequent direct contact</li> </ul>	Possible	Moderate	Medium	<ul style="list-style-type: none"> <li>• Environmental awareness training</li> <li>• Site inductions</li> <li>• Material Tracking System</li> <li>• Stockpile management</li> <li>• Management of imported/transferred materials</li> <li>• Management of dewatering effluent</li> <li>• Acid Sulfate Soils Management Plan</li> </ul>	Rare	Moderate	Low



# 10. Environmental Management Measures for Contamination

## 10.1 INTRODUCTION

Potential impacts caused by the mismanagement of contaminated material during construction can be summarised as:

- Impacts to human health from inappropriate handling of contaminated materials, and
- Contamination or deterioration of current environmental quality of land, surface water and/or groundwater.

The risk assessment in Section 9 identifies that contamination at the site requires management to mitigate the risk of potential impacts to human health, the environment and environmental values. The following sections outline:

- The objectives and targets of contamination management,
- Required management/control measures,
- Responsibilities for implementation,
- Monitoring and reporting, and
- Contingency measures.

## 10.2 MATERIAL TRACKING SYSTEM

The Material Tracking System records all material movement relative to the site. All documentation relating to the Material Tracking System will require compilation for submission with the monthly environmental report. Material placement information at the completion of construction will be required to inform ongoing management requirements.

### Objectives

- To track the import, transfer and export of materials to, from and within Site 6.
- Provide documentation that materials have been imported, transferred and exported in accordance with this PCMP.

### Target

- All materials are handled and placed in a manner that will not result in unacceptable risk to human health, the environment or environmental values based on their contamination status.

Table 10-1 Material Tracking System

Management Action	Documentation	Responsibility	Timing
Material brought on site requires accompanying records indicating quantity, quality and suitability for use on site	Laboratory analytical results (where applicable) Clean Fill Certificates/Forms Records of material volume Monthly environmental report	Contractor	Prior to importation of material
Periodic documentation of stockpiling and placement of materials on site including details of material type, volume, location, depth	Site plans/surveys Tabulated records of type/volume/location/depth (where applicable) GPS coordinates	Contractor	Throughout construction activities



Management Action	Documentation	Responsibility	Timing
	Survey plans (where applicable) Monthly environmental report		
Documentation of materials taken off site including records of quantity, on site source location and suitability for reuse on an alternative site or disposal off site	Laboratory analytical results (where applicable) Clean Fill Certificates/Forms Records of material volume Waste disposal receipts/ acknowledgement of receiving party Monthly environmental report	Contractor	Throughout construction activities
Documentation of tracking of any hazardous materials taken off site using the appropriate waste transport certificates	Laboratory analytical results (where applicable) Records of material volume Transport records Waste disposal receipts/ acknowledgement of receiving party Monthly environmental report	Contractor Waste transport sub-contractor	Prior to and during hazardous material transport activities

### 10.3 IMPORTED MATERIAL (FROM OUTSIDE PERTH AIRPORT ESTATE) MANAGEMENT PROCEDURE

*Objective*

To ensure all materials imported to Site 6 from outside the airport estate are appropriate for the planned land use and will not result in a deterioration in environmental quality of the site.

*Target*

Any material imported to the site from areas outside the Perth Airport estate must meet the definition of 'Clean Fill' or 'Uncontaminated Fill' per the Landfill Waste Classification and Waste Definitions 1996 (as amended 2018) (DWER, 2018).

Table 10-2 Material imported to Site 6 from outside the Perth Airport estate

Management Action	Documentation	Responsibility	Timing
All personnel to complete environmental awareness training and site induction	Training records	Perth Airport Contractor All sub-contractors	Prior to commencement of works
Imported material to meet the definition of 'Clean Fill' or 'Uncontaminated Fill' as per Landfill Waste Classification and Waste Definitions 1996 (DWER, 2018)	Clean Fill Certificates/Forms Records of material volume Record movement in Material Tracking System Monthly environmental report	Contractor	Throughout construction
If documentation of material status is unavailable, conduct sampling in accordance with Landfill Waste Classification and Waste Definitions 1996 (DWER, 2018) to assess	Laboratory analytical results Clean Fill Certificates/Forms Records of material volume Material Tracking System Monthly environmental report	Contractor Contractor's appointed environmental consultant	Throughout construction



Management Action	Documentation	Responsibility	Timing
whether material meets definition of 'Uncontaminated Fill' Any sampling conducted to confirm material suitability must be undertaken by a suitably qualified environmental professional			
Manage stockpiles of imported materials in a manner consistent with the Stockpile Management Strategy	Records of environmental inspections/audits	Contractor Perth Airport	Throughout construction

**10.4 PROCEDURE FOR ASSESSMENT OF MATERIAL TRANSFERRED TO SITE 6 FROM WITHIN PERTH AIRPORT ESTATE**

*Objective*

To ensure all materials imported to Site 6 from within the Perth Airport estate are appropriate for the proposed land use and will not result in a deterioration in environmental quality of the site.

*Target*

Material imported for use within Site 6 must contain concentrations of COPC below the following assessment criteria:

- Ecological Investigation Level (EIL) and Ecological Screening Level (ESL) – applicable to commercial/industrial land use (NEPC 2013)
- Health Investigation Level (HIL) and Health Screening Level (HSL) - applicable to commercial/industrial land use (D) (NEPC 2013)
- 'Non-detect'<sup>2</sup> for asbestos (ACM, AF or FA) (DoH 2009)
- Perfluorooctanoic acid (PFOA): 0.45 µg/kg
- Perfluorohexanesulfonic acid (PFHxS): 0.56 µg/kg
- Perfluorooctanesulfonic acid (PFOS): 1.97 µg/kg
- PFHxS + PFOS: 2.42 µg/kg
- Leachable PFHxS + PFOS: 0.07 µg/L
- Leachable PFOA: 0.56 µg/L

<sup>2</sup> DoH (2009) guidelines require that if practical, laboratories should estimate the concentration of any asbestos, especially for >2 mm size asbestos material. NATA Chemical Testing Field Application Document (5.10.1, page 28) states, "Quantitative estimates cannot be included on reports". Similarly, AS 4964-2004 states in the preface that it is a qualitative technique and "PLM is qualitative technique only". NATA News, September 2011 – page 34, states, "Weighing of fibres is problematic and can lead to loss of fibres and potential exposure for laboratory analysts. To request laboratories to report information which is outside the scope of AS 4964-2004 and the scope of their accreditation is misleading and is most unwise." On this basis, Perth Airport will request that the laboratory reports both the NATA accredited result with standard detection limit (0.01% w/w) and the reduced detection limit (0.001% w/w) and a non-detect in both instances will form the adopted assessment criteria.





Table 10-3 Material transferred to Site 6 from within the Perth Airport estate

Management Action	Documentation	Responsibility	Timing
All personnel to complete environmental awareness training and site induction	Training records	Perth Airport Contractor All sub-contractors	Prior to commencement of works
Sampling densities for stockpiles of transferred material must be in accordance with NEPM (NEPC 2013). NEPM stipulates using a systematic three-dimensional grid to account for spatial variability. Surface sampling from the stockpile will not be sufficient to categorise its contents. Sampling must be uniformly distributed throughout the stockpile, including sampling at depth. Collection of samples from the exterior 300 mm of the stockpile should be avoided due to the higher risk of weathering and grain size grading errors.	Field sampling records Monthly environmental report	Contractor Contractor's appointed environmental consultant	Throughout construction
Any sampling conducted to confirm material suitability must be undertaken by a suitably qualified environmental professional. This includes the selection of COPC requiring assessment.	Information pertaining to the current and historical land use activities conducted on the site of material origin. Existing analytical data	Contractor Contractor's appointed environmental consultant	Throughout construction
Concentrations of COPC in transferred material must be below the guideline values identified above.	Laboratory analytical data Tabulation of data in comparison to relevant guideline values Monthly environmental report	Contractor Contractor's appointed environmental consultant	Throughout construction
Manage stockpiles of transferred material in accordance with the stockpile management strategy	Results of environmental audits/inspections Monthly environmental report	Contractor Perth Airport	Throughout construction
Record details of transfer in Material Tracking System	Laboratory analytical results Clean Fill Certificates/Forms Records of material volume GPS coordinates Site plans	Contractor	Throughout construction



Management Action	Documentation	Responsibility	Timing
	Monthly environmental report		

Note: See Appendix C for NEPM decision making framework relating to the reuse of material containing PFAS.

**10.5 PROCEDURE FOR ASSESSMENT OF MATERIAL TRANSFERRED FROM IN SITE 6 FOR REUSE WITHIN SITE 6**

Table 10-4 Material transferred from within Site 6 for reuse within Site 6

Management Action	Documentation	Responsibility	Timing
All personnel to complete environmental awareness training and site induction	Training records	Perth Airport Contractor All sub-contractors	Prior to commencement of works
Material excavated from within the inferred area of historical uncontrolled filling (Figure 8-1) must automatically be considered as unsuitable for reuse within Site 6 without further assessment.	Material Tracking System Monthly environmental report	Contractor	Throughout construction
Material excavated from within the former SMD alignment (Figure 8-1) must automatically be considered as unsuitable for reuse within Site 6 without further assessment.	Material Tracking System Monthly environmental report	Contractor	Throughout construction
If sampling is conducted on materials from the historical area of uncontrolled fill or the former drain alignments, sampling densities for stockpiles of these materials must be in accordance with NEPM (NEPC 2013). NEPM stipulates using a systematic three-dimensional grid to account for spatial variability. Surface sampling from the stockpile will not be sufficient to categorise its contents. Sampling must be uniformly distributed throughout the stockpile, including sampling at depth. Collection of samples from the exterior 300 mm of the stockpile should be avoided due to the higher risk of weathering and grain size grading errors.  Sampling must be undertaken by a suitable qualified environmental professional.  Concentrations of COPC in transferred material must be below the guideline values identified in Section 10.4.	Laboratory analytical data Field sampling records Monthly environmental report Tabulation of data in comparison to relevant guideline values	Contractor Contractor's appointed environmental consultant	Throughout construction
Manage stockpiles of material in accordance with the stockpile management strategy	Results of environmental audits/inspections	Contractor Perth Airport	Throughout construction



Management Action	Documentation	Responsibility	Timing
	Monthly environmental report		
Record details of transfer in Material Tracking System	Laboratory analytical results Clean Fill Certificates/Forms Records of material volume GPS coordinates Site plans Monthly environmental report	Contractor	Throughout construction

Note: See Appendix C for NEPM decision making framework relating to the reuse of material containing PFAS.

## 10.6 STOCKPILE MANAGEMENT STRATEGY

### Objective

To ensure all materials stockpiled within Site 6 are managed in a manner which will not result in a deterioration in environmental quality of the site.

### Target

That there are no uncontrolled discharges/emissions (e.g. excessive dust, leachate generation, sediment runoff) from stockpiled materials on Site 6.

**Table 10-5 Stockpile Management Strategy**

Management Action	Documentation	Responsibility	Timing
All personnel to complete environmental awareness training and site induction	Training records	Perth Airport Contractor All sub-contractors	Prior to commencement of works
<b>Material from Inferred Landfill Extent and Former Drain Alignment</b>			
Store onsite in dedicated areas bunded with at least 300mm of clean material and lined with high-density polyethylene (HDPE)	Material Tracking System Results of environmental audits/inspections	Contractor Perth Airport	Throughout construction
The existing ground will be sampled prior to stockpiling of material to establish baseline soil conditions. Soil validation is required after removal of stockpile. Any sampling conducted must be undertaken by a suitably qualified environmental professional.	Material Tracking System Results of environmental audits/inspections Laboratory documentation Field sampling records	Contractor Perth Airport Contractor's environmental consultant	Throughout construction
Signage indicating the contamination status of the material is required.	Material Tracking System Results of environmental audits/inspections	Contractor Perth Airport	Throughout construction
Workers must wear personal protective equipment (PPE) at all times during works which may result	Results of environmental inspections/audits	Contractor All sub-contractors	Throughout construction



Management Action	Documentation	Responsibility	Timing
in contact with contaminated material. This includes hard hat, safety glasses, long sleeves and long trousers, steel capped lace-up boots and gloves.			
All personnel involved in works contacting contaminated material must employ good personal hygiene practices e.g. washing hands prior to eating, drinking smoking or toileting.	Results of environmental inspections/audits	Contractor All sub-contractors	Throughout construction
<b>All Other Materials</b>			
Store onsite in dedicated area away from contaminated material.	Material Tracking System Results of environmental audits/inspections	Contractor Perth Airport	Throughout construction
Stockpiles must be below fence lines when within five metres of the site boundary.	Material Tracking System Results of environmental audits/inspections	Contractor Perth Airport	Throughout construction
Dust management measures to be implemented.	Material Tracking System Results of environmental audits/inspections	Contractor Perth Airport	Throughout construction
Materials identified as ASS to be managed in accordance with the Contractor's ASSMP and must meet all requirements of this PCMP	Material Tracking System Results of environmental audits/inspections ASSMP	Contractor Perth Airport	Throughout construction

**10.7 MATERIAL CHARACTERISATION FOR OFFSITE DISPOSAL**

*Objective*

To ensure all materials generated from Site 6 development which are destined for offsite disposal are appropriately characterised to enable disposal to a suitably licensed offsite facility.

*Target*

All materials requiring offsite disposal are accepted into an appropriately licensed offsite facility.

**Table 10-6 Material Characterisation for Offsite Disposal**

Management Action	Documentation	Responsibility	Timing
All personnel to complete environmental awareness training and site induction	Training records	Perth Airport Contractor All sub-contractors	Prior to commencement of works
Materials requiring offsite disposal to a licensed landfill facility will require characterisation in accordance with the requirements of Landfill Waste Classification and Waste Definitions 1996 (DWER, 2018).	Field sampling records Material Tracking System Monthly environmental report	Contractor Contractor's environmental consultant	Throughout construction
Sampling of all materials must be undertaken by a suitably qualified environmental professional.	Field sampling records Laboratory analytical results	Contractor Contractor's environmental consultant	Throughout construction





Management Action	Documentation	Responsibility	Timing
	Tabulated analytical results with comparison to appropriate guidelines		
Loading and transport of waste materials must be conducted in a manner to minimise spillage and dust generation. N.B. Additional conditions apply to the transport of PFAS impacted materials – see Appendix C.	Results of environmental inspections/audits Monthly environmental report	Contractor	Throughout construction
Offsite disposal to an appropriately licensed landfill facility	Waste disposal dockets/receipts Material Tracking System Monthly environmental report	Contractor	Throughout construction
Workers must wear personal protective equipment (PPE) at all times during works which may result in contact with contaminated material. This includes hard hat, safety glasses, long sleeves and long trousers, steel capped lace-up boots and gloves.	Results of environmental inspections/audits	Contractor All sub-contractors	Throughout construction
All personnel involved in works contacting contaminated material must employ good personal hygiene practices e.g. washing hands prior to eating, drinking smoking or toileting.	Results of environmental inspections/audits	Contractor All sub-contractors	Throughout construction

**10.8 PROCEDURE FOR ASSESSING SUITABILITY OF MATERIAL FROM SITE 6 FOR REUSE WITHIN OTHER AREAS OF PERTH AIRPORT ESTATE**

Soil excavated from areas within Site 6 may be considered for transfer and reuse elsewhere within the Perth Airport estate in accordance with the Fill Material Management Guideline (document PAPL-ENV-GDL-006) and Fill Material Use Form (PAPL-ENV-FOR-001), available at perthairport.com.au/tenant-and-contractor-environment-management. The management actions below are specific to the Site 6 development and are in addition to the requirements of the guideline.

**Objective**

To ensure all materials derived from Site 6 and reused elsewhere within the Perth Airport estate are appropriate for the proposed land use and will not result in a deterioration in environmental quality of the placement site.

**Target**

Material derived from Site 6 and reused elsewhere within the Perth Airport estate will be of a contamination status consistent with existing materials in the placement site.

**Table 10-7 Material transferred from within Site 6 for reuse within other areas of the Perth Airport estate**

Management Action	Documentation	Responsibility	Timing
All personnel to complete environmental awareness training and site induction	Training records	Perth Airport Contractor	Prior to commencement of works



Management Action	Documentation	Responsibility	Timing
		All sub-contractors	
Material excavated from within the inferred area of historical uncontrolled filling (Figure 8-1) must automatically be considered as unsuitable for reuse within other areas of the Perth Airport estate without further assessment.	Material Tracking System Monthly environmental report	Contractor	Throughout construction
Material excavated from within the former SMD alignment (Figure 8-1) must automatically be considered as unsuitable for reuse within other areas of the Perth Airport estate without further assessment.	Material Tracking System Monthly environmental report	Contractor	Throughout construction
<p>If sampling is conducted on materials from the historical area of uncontrolled filling or former drain alignments, sampling densities for stockpiles of materials proposed to be transferred must be in accordance with Landfill Waste Classification and Waste Definitions 1996 (DWER, 2018).</p> <p>Any sampling conducted to confirm material suitability must be undertaken by a suitably qualified environmental professional. This includes the selection of COPC requiring assessment.</p> <p>Concentrations of COPC in material proposed to be transferred must be below the guideline values deemed by an appropriately qualified environmental consultant to be appropriate for the proposed land use.</p>	Laboratory analytical data Field sampling records Monthly environmental report Tabulation of data in comparison to relevant guideline values	Contractor Contractor's appointed environmental consultant	Throughout construction
Manage stockpiles of material in accordance with the stockpile management strategy	Results of environmental audits/inspections	Contractor Perth Airport	Throughout construction
Record details of transfer in Material Tracking System	Laboratory analytical results Clean Fill Certificates/Forms Records of material volume GPS coordinates Site plans Monthly environmental report	Contractor	Throughout construction



### 10.9 PROCEDURE FOR MANAGEMENT OF DEWATERING EFFLUENT

All dewatering groundwater effluent must be assumed to be PFAS impacted unless determined to be otherwise through appropriate environmental testing.

PFAS impacts are pre-existing across the site and therefore the main objective of dewatering management is to minimize the risk of further impacts being created or spread by the works. All extracted groundwater will be re-infiltrated into the superficial aquifer within the airport estate. Whilst it is recognised that the abstracted dewatering effluent will be re-infiltrated into the same superficial aquifer, and that there will be no net change in the PFAS groundwater concentrations or site risk profile, it is proposed that all abstracted groundwater will be treated to minimise the potential for PFAS to re-enter the environment. The following strategy represents practicable and reasonable measures which can be taken to ensure PFAS impacts are appropriately managed and contingency measures are implemented if required.

Dewatering (and associated activities such as the re-infiltration of dewatering effluent) must occur in accordance with an ASSMP, which must detail also the dewatering activities along with the management and treatment of PFAS within the groundwater. The ASSMP will be prepared by the successful contractor/s for inclusion in the CEMP. The ASSMP must meet the requirements of this PCMP.

**Objective**

To manage dewatering effluent in a manner which is appropriately protective of human health and does not result in deterioration in environmental quality of the site, or areas in the vicinity of the site. And, to minimise the potential for PFAS to re-enter the environment.

**Target**

No uncontrolled contact with dewatering effluent.

Mean re-infiltration effluent PFAS water quality is to be lower than the mean extracted PFAS water quality.

Mean re-infiltration effluent PFAS water quality is to be lower than the ecosystem freshwater guideline values for the 90% species protection (NEMP, 2018).

- Below 90% Species Protection Criteria
  - PFOS, 2 µg/L
  - PFOA, 632 µg/L

To ensure compliance with the re-infiltration limit above, PFAS treatment systems are to be designed to achieve water quality at or below the ecosystem freshwater guideline values for the 95% species protection (NEMP, 2018).

- 95% Species Protection Criteria
  - PFOS, 0.13 µg/L
  - PFOA, 220 µg/L

**Table 10-8 Management of Dewatering Effluent**

Management Action	Documentation	Responsibility	Timing
All personnel to complete environmental awareness training and site induction	Training records	Perth Airport Contractor All sub-contractors	Prior to commencement of works
Workers must wear personal protective equipment (PPE) at all times during works which may result in contact with groundwater. This includes hard hat, safety glasses, long sleeves and long trousers, steel	Environmental inspections/audits	Contractor All sub-contractors	Throughout dewatering activities



Management Action	Documentation	Responsibility	Timing
capped lace-up boots (waterproof boots/waders are recommended if workers may get their feet wet in the course of required activities) and gloves.			
All personnel involved in works contacting groundwater must employ good personal hygiene practices e.g. washing hands prior to eating, drinking smoking or toileting.	Environmental inspections/audits	Contractor All sub-contractors	Throughout dewatering activities
A groundwater treatment plant must be available to treat all dewatering effluent with the capacity to treat water up to the anticipated abstraction rates	Operations and specifications of treatment provided within the ASSMP developed by the contractor	Contractor All sub-contractors	Throughout dewatering activities
<p>Periodic monitoring of pre and post treated dewatering effluent.</p> <p>After commissioning treatment system, output dewater will be tested ensure compliance to target criteria. On commencement of dewatering, monitoring of pre and post treatment effluent is to be conducted daily for PFAS (noting a delay in the receipt of the PFAS laboratory results due to sample distribution and analysis timeframes).</p> <p>Where effluent discharge is below 95% Species Protection Criteria continuously for 1 week, monitoring frequency may reduce to weekly sampling.</p> <p>Any sampling must be conducted by an appropriately qualified environmental consultant.</p>	<p>Monitoring procedures and frequency provided within the ASSMP developed by the contractor</p> <p>Field sampling records</p> <p>Laboratory analytical data</p> <p>Tabulated analytical data</p> <p>Monthly environmental report</p>	Contractor Contractor's environmental consultant	Throughout dewatering activities
<p>Contingency measures will be implemented where successive exceedances of the 90% Species Protection Criteria are reported.</p> <p>These may include increased monitoring frequency, rescheduling works, increased treatment capacity or implementing engineering controls (e.g. sheet piling).</p>	<p>Contingency measure provided within the ASSMP developed by the contractor</p> <p>Monthly environmental report</p>	Contractor Contractor's environmental consultant	Throughout dewatering activities
Dewatering water/effluent generated may be re-infiltrated, as long as it is re-infiltrated within the site boundary, as close to the abstraction point as feasible, in the	Environmental inspections/audits Material Tracking System	Contractor	Throughout dewatering activities





Management Action	Documentation	Responsibility	Timing
same volume as abstracted and into the same aquifer. (i.e. into the same aquifer that it was extracted from. Note that the influence of ASS must also be considered in accordance with the CEMP developed by the contractor/s.	Monthly environmental report Measures for tracking groundwater abstraction, storage and re infiltration within the CEMP developed by the contractor		
Prior to and at the completion of dewatering and re-infiltration activities for the project, the re-infiltration sumps must be sampled to confirm that the re-infiltration of PFAS impacted groundwater has not resulted in deterioration of soil quality. Any sampling must be conducted by an appropriately qualified environmental consultant.	Field sampling records Laboratory analytical data Tabulated analytical data Monthly environmental report	Contractor Contractor's environmental consultant	Prior to dewatering commencement At the completion of dewatering

**10.10 CONTINGENCY MEASURES**

Instances where contingency measures require implementation must be recorded in the monthly environmental report.

*Objective*

To manage unexpected finds in a manner which is appropriately protective of human health, the environment and environmental values.

*Target*

No negative impacts to human health and no deterioration in environmental quality at the site caused by unexpected finds.

**Table 10-9 Monitoring and Contingency Measures**

Monitoring	Frequency	Method	Trigger	Corrective Action
Unexpected finds	Daily and weekly inspection	Visual Inspection	Confirmation of unexpected find on site	Stop relevant work Implement Unexpected Finds Procedure (Appendix D) If asbestos impacted soils or ACM are identified implement Asbestos Management Procedure (Appendix E)
Stockpiles	Daily and weekly inspection	Visual Inspection	Runoff occurring from the stockpiles	Stop runoff from occurring by increasing bund height Organise for stockpiles to be removed to a licensed off-site disposal location Confirm water quality of runoff based on laboratory analysis Monitor receiving environment for negative impacts



Soil beneath stockpiles	Removal of stockpiles	Chemical test of soil samples	Soil samples from beneath the stockpile areas or within the re-infiltration sumps indicate concentrations of contaminants of concern above the adopted assessment criteria	Retain material on site beneath 0.5m of clean fill or hardstand to eliminate exposure risks. If not possible, excavate impacted material and removal to a licensed off-site disposal location  Validate base and walls of excavation in-situ
PFAS concentration in one groundwater well within the work area in case a plume of high PFAS groundwater is being pulled towards area from cross or up hydraulic gradient	Fortnightly	Chemical Testing	PFAS concentration greater than 20% of background values historically recorded on site (Figure 8-3).	Should PFAS concentration in the surrounding groundwater exceed the trigger values for two consecutive monitoring events, stop works will be enacted. Monitoring will continue in the well network until two consecutive monitoring events have demonstrated that all PFAS analytes are below the trigger values.  Further contingency measures are currently being developed in a pre-emptive manner however it should be noted that any contingency will be approved by Perth Airport and DIRDC Airport Environment Officer prior to enactment.
Dust	Daily and weekly inspection	Visual Inspection	Excessive dust generation as determined by visual observation	Stop relevant work activity Investigate cause Implement appropriate dust control measures  Monitor success of control measure. If the measure is inadequate, seek alternative measures

All monitoring detailed in Table 10-9 will occur throughout the duration of the project.

**10.11 ENVIRONMENTAL AUDITING**

Compliance with this PCMP will be assessed during periodic audits conducted by Perth Airport and the relevant contractor/s. At a minimum Perth Airport will conduct compliance and assurance audits for this project quarterly, commencing during initial earthworks. These audits will review compliance with the requirements of this PCMP. The findings of the Perth Airport audits will be included in the monthly environmental reports provided to the DIRDC Airport Environment Officer.

The contractor/s will provide copies of all relevant inspections and audits to Perth Airport on request.

**10.12 DOCUMENTS AND RECORDS MANAGEMENT**

All documents and records relevant to or generated by the Site 6 works will be managed by Perth Airport in accordance with Perth Airport’s existing document management system and project document management requirements.

Upon request, the contractor/s will make available all inspection and audit records, monitoring and waste disposal records to demonstrate compliance with requirements of this PCMP. Upon completion of the



project, the contractor/s will submit a completion report to Perth Airport detailing all material movements associated with the characterisation, storage, transfer and disposal of contaminated materials.

### **10.13 PCMP REVIEW**

The PCMP will be reviewed on a 12-month basis for the period construction works are ongoing at Site 6 unless a review is required prior due implementation of corrective actions.



# 11. Abbreviations and Acronyms

AHD	Australian Height Datum
ASS	Acid Sulfate Soils (refers to both potential ASS and actual ASS, as defined in DER 2015)
ASSMP	Acid Sulfate Soils Management Plan
ASC NEPM	National Environmental Protection (Assessment of Site Contamination) Measure
bgl	Below ground level
BTEXN	Benzene, Toluene, Ethylbenzene, Xylenes and Naphthalene
COPC	Chemical of Potential Concern
CEMP	Construction Environment Management Plan
CSM	Conceptual Site Model
DEE	Department of the Environment and Energy
DoH	Department of Health
DIRDC	Department of Infrastructure, Regional Development and Cities
DER	Department of Environment Regulation
DSI	Detailed Site Investigation
DWER	Department of Water and Environmental Regulation
EnRisks	Environmental Risk Services Pty Ltd
EIL	Ecological Investigation Level
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
ESA	Environmental Site Assessment
ESL	Ecological Screening Level
FWG	Fresh Water Guideline
GME	Groundwater Monitoring Event
ha	Hectare
HEPA	Heads of Environmental Protection Agencies Australia and New Zealand
HIL	Health Investigation Level
HSL	Health Screening Level
MDP	Major Development Plan (as defined in the Airports Act 1996)
mg/kg	Milligrams per kilogram
NATA	National Association of Testing Authorities
NEPC	National Environment Protection Council
NEMP	National Environmental Management Plan
NEPM	National Environment Protection Measure
OEMP	Operational Environment Management Plan
PCMP	PFAS and Contamination Management Plan (this document)
PFAS	Per and Poly-Fluoroalkyl Substances
PFHxS	Perfluorohexane Sulfonate
PFOA	Perfluorooctanoic Acid
PFOS	Perfluorooctane Sulfonate
PSI	Preliminary Site Investigation
QA/QC	Quality Assurance/Quality Control
RWG	Recreational Water Guidelines
SMD	Southern Main Drain
TRH	Total Recoverable Hydrocarbons
WA	Western Australia
µg/L	Micrograms per Litre



## 12. References

ASC NEPM. National Environment Protection (Assessment of Site Contamination) Measure 1999, National Environment Protection Council, as varied 2013.

DoE, 2014. Environmental Management Plan Guidelines, Department of the Environment, 2014.

EnRiskS, 2017. Risk Based Criteria for Soil and Dewater Reuse at Perth Airport. Unpublished report prepared for Perth Airport Pty Ltd by Environmental Risk Sciences Pty Ltd, June 2018.

JBS&G, 2018. Preliminary Site Investigation, Site 6 Airport West. Unpublished report prepared for Perth Airport Pty Ltd by JBS&G Australia Pty Ltd, December 2018.

Perth Airport, 2018. Major Development Plan for Site 6: Large Format Retail Outlet. Perth Airport Pty Ltd, December 2018 (see [perthairport.com.au/majordevelopmentplans](http://perthairport.com.au/majordevelopmentplans)).

PFAS NEMP, 2018. PFAS National Environmental Management Plan, Heads of Environmental Protection Agencies Australia and New Zealand, January 2018.





# Appendices





## A. Consistency of the PCMP with MDP Conditions of Ministerial Approval

Condition	Requirement	PCMP Section	Comments
4.	To manage the risks associated with PFAS, PAPL must conduct a Tier 1 Preliminary Site Investigation that meets the requirements of the National Environment Protection (Assessment of Site Contamination) Measure (ASC NEPM) (NEPC 1999) (see Figure 1). The investigation required must include a desktop historical review of past practices. Other site investigations and assessments must, when required, be conducted in accordance with the requirements of Schedules A and B in the ASC NEPM (NEPC 1999).	1.4	A Tier 1 Preliminary Site Investigation (PSI) was completed by JBS&G Australia Pty Ltd in December 2018.  The findings of the PSI supported the development of the Site 6 PCMP.
5.	If the site investigations and assessments required in condition 4 confirm the presence of PFAS, or if they conclude that PFAS are likely to be encountered during the construction or ongoing operations of the project area, PAPL must:		
a.	prepare a CEMP containing a section or a separate document on PFAS management	1.2	A PFAS and Contamination Management Plan (PCMP) (this document) has been prepared for Site 6. This PCMP will form part of each successful contractor's Construction Environment Management Plan (CEMP).
b.	submit the CEMP to the Environment Minister for approval	1.1	This PCMP has been approved by the Minister for the Environment.
c.	not commence the action unless the Environment Minister has approved the CEMP	1.1	Site 6 works will not commence until the MDP Conditions of Ministerial Approval (including the Minister for the Environment's approval of this PCMP) is received.
d.	implement the approved CEMP	1.2	This PCMP will be implemented by each successful contractor.



Condition	Requirement	PCMP Section	Comments
e.	publish the CEMP on the website	n/a	The approved PCMP will be published on the Perth Airport website, perthairport.com.au/majordevelopmentplans
i.	no later than seven (7) business days after commencement of the action	n/a	The approved PCMP will be published on the Perth Airport website within 7 days of commencement of Site 6 works
ii.	until three (3) months after completion of the action	n/a	The approved PCMP will be published on the Perth Airport website until 3 months after completion of the Site 6 works
6.	The CEMP required under condition 5 must		
a.	contain procedures that must be followed for assessing and managing contamination of soil and water by PFAS	10	Section 10 of the PCMP details the procedures that will be followed for assessing and managing contamination of soil and water by PFAS.
b.	be consistent with the National Water Quality Management Strategy, including the Australian and New Zealand Guidelines for Fresh and Marine Water Quality	1.3	The National Water Quality Management Strategy (NWQMS) has been considered as it is captured within, and provides the framework to, the National Environment Protection Measure National Environment Protection Council (NEPM NEPC 2013), which has been considered in the PCMP. Schedule B6 of the NEPM provides a framework for the assessment of groundwater contamination based on the NWQMS, Australian and New Zealand guidelines for fresh and marine water quality (AWQG) (ANZECC & ARMCANZ 2000), the Australian drinking water guidelines (ADWG) (NHMRC & NRMCC 2004) and the Guidelines for managing risk in recreational water (GMRRW) (NHMRC 2008).
c.	be consistent with the PFAS National Environmental Management Plan (2018), including its guideline values, as amended from time to time, and	1.3	This PCMP has been prepared to meet the requirements of the PFAS National Environmental Management Plan.  Appendix B provides a checklist demonstrating consistency with each requirement.
d.	include		
i.	project scope and boundaries	2	Section 2 identifies the site, surrounding land use and environmental setting of the project. It also provides details of the proposed development including key activities and a preliminary schedule.
ii.	roles and responsibilities	4	Section 4 identifies key roles and responsibilities for environmental management during the project.



Condition	Requirement	PCMP Section	Comments
iii.	the site conceptual model - including maps and any monitoring data - identifying the extent concentrations of possible contamination within the project footprint and nearby	8	Section 8 provides the contamination conceptual site model for Site 6, based on known and suspected contamination identified in the Preliminary Site Investigation.
iv.	possible exposure pathways and ecological receptors - both directly within the project area and also from the project area to any nearby receptors	8	Section 8.2 identifies sources of contamination, Section 8.3 identifies onsite and offsite receptors, Section 8.4 identifies transport mechanisms, Section 8.5 identifies exposure pathways, and Section 8.6 discusses potentially complete exposure scenarios.  Figure 8-2 and Figure 8-3 depict historical sampling locations and analytical data for soil and groundwater within Site 6.
v.	the site-specific risk assessment that identifies possible risks tailored to the reported or expected PFAS concentrations, exposure pathways, and potential receptors on and off the project area	9.4	Section 9.4 provides a site-specific risk assessment based on the methodology presented in DEE EMP Guidelines Section 4, Evaluating Risk. The risk assessment considers both PFAS and other contaminants of concern identified as relevant to the site.
vi.	procedures for the management or remediation of PFAS contamination within the project area	10	Section 10 details the management/control measures identified as necessary during the risk assessment process. The management measures are applicable to both PFAS and other contaminants of concern identified as relevant to the site.
vii.	strategies to reduce runoff and migration of contamination within and off the proposed project area	10	Section 10 provides the details of required management of all types of material (contaminated and uncontaminated), in addition to specific management measures for imported or transferred materials.
viii.	operational procedures for managing earthworks and the stockpiling or storage of contaminated water / soil / rock / concrete / tarmac / etc, including in relation to encapsulation, bunding, leachate control and disposal	10	Section 10 provides the details of required management of all types of material (contaminated and uncontaminated), in addition to specific management measures for imported or transferred materials.
ix.	if necessary, a contingency action plan for unexpected PFAS contaminant discoveries	10.10	Section 10.10 provides contingency measures and refers to the Unexpected Finds Procedure (Appendix D) and the



Condition	Requirement	PCMP Section	Comments
			Asbestos Management Procedure (Appendix E).
x.	any one-off or ongoing soil and water monitoring requirements and testing procedures, and their relevant QA/QC procedures	10	Sampling requirements for different types of materials are detailed in Section 10, with additional information regarding requirements specific to sampling for PFAS provided in Appendix C.
e.	impose the following requirements,		
i.	Any PFAS contaminated material (including but not limited to excavated soil or sediment, leachate from soil or sediment, water arising from de-watering of soil or sediment, concrete, tarmac, appliances, pumps, pipes, hoses, fittings) must be handled appropriately and disposed of in an environmentally sound manner such that potential for the PFAS content to enter the environment is minimised.	10 Appendix C	Section 10 provides management measures for all types of material (including material intended for offsite disposal) to ensure minimal impact to the environment.  Appendix C provides the risk assessment process followed (per the requirements of NEMP) to determine suitability for reuse of minimally PFAS impacted materials for reuse within Site 6.
ii.	Any PFAS contaminated material with a PFOS, PFHxS or PFOA content above 50 milligrams per kilogram or litre (mg/kg or L), must be stored or disposed of in an environmentally sound manner that will achieve nil environmental release of their PFAS content.	Appendix D	It is not anticipated that materials with this level of PFAS will be identified within Site 6. Identification of such material would constitute an unexpected find and the Unexpected Finds Procedure (Appendix D) would be implemented.
f.	detail how materials at the concentrations listed at d(ii), if encountered, would be handled to achieve zero environmental release.	Appendix D	It is not anticipated that materials with this level of PFAS will be identified within Site 6. Identification of such material would constitute an unexpected find, and the Unexpected Finds Procedure (Appendix D) would be followed.





## B. Consistency of the PCMP with Relevant Guidelines

Consistency of the PCMP with the Environmental Management Plan Guidelines (DoE, 2014)

Environmental Management Plan Guidelines (Department of the Environment, 2014)	Location in PCMP
Cover page and declaration of accuracy	Cover page (Declaration of accuracy not included)
Document version control	Page i
Table of contents	Page ii
Executive summary or introduction	Section 1 - Introduction
Conditions of approval reference table	Appendix A
Project description	Section 2 - Project Description
Objectives	Section 3 - Objectives
Environmental management roles and responsibilities	Section 4 - Environmental Management Roles and Responsibilities
Reporting	Section 5 - Reporting
Environmental training	Section 6 - Environmental Training
Emergency contacts and procedures	Section 7 - Emergency Contacts and Procedures
Potential environmental impacts and risks	Section 9 - Potential Environmental Impacts and Risks of Contamination
- Threats to matters protected under the EPBC Act	Section 9.2
- Potential impacts	Section 9.3
- Risk assessment	Section 9.4
Environmental management measures	
- Environmental management activities, controls and performance targets	Section 10 - Environmental Management Measures for Contamination
- Environmental management maps and diagrams	Section 8 and 9
- Environmental monitoring	Section 10 (sampling strategies for different types of material)
- Corrective actions	Section 5 and Section 10.9
Audit and review	Environmental Auditing
- Environmental auditing	Section 10.11
- Environmental management plan review	Section 10.13
Glossary	Section 11



## Consistency of the PCMP with the PFAS National Environmental Management Plan (HEPA, 2018)

PFAS National Environmental Management Plan (HEPA, January 2018)	PCMP Section	Comment
Understanding the PFAS content of products and/or presence of PFAS contamination, for example, by determining the concentrations of PFAS present and/or the nature and location of PFAS sources.	Section 8.2	Section 8.2 describes the identified known and potential sources of contamination (including PFAS contamination) at the site. Figure 8-2 and <b>Figure 8-3</b> depict historical sampling locations relevant to Site 6.
Understanding the environmental values that may be impacted by the contamination, both on- and off-site, such as determining the surface water and groundwater environments and determining what the water is used for. Important issues include any off-site movement, PFAS transformations and exposure pathways.	Section 2.2  Section 8	Section 2.2 provides a description of the environmental setting of the site, including: surrounding land use; topography; hydrology; geology and acid sulfate soils; hydrogeology; EPBC protected matters; and contamination status of other areas in the vicinity of the site.  Section 8 provides a contamination conceptual site model for the site, which includes consideration of known and suspected contamination sources; on and offsite receptors; transport mechanisms; exposure pathways; and provides an assessment of potentially complete exposure scenarios.
Taking all reasonable and practicable measures to prevent or minimise potential environmental harm from PFAS-related activities and contamination, such as ensuring PFAS wastes, contaminated materials and products are effectively stored and/or remediated to prevent release and having appropriate contingency plans to deal with leaks and spillage.	Section 10	Section 10 provides the details of proposed management/control measures to mitigate the risk of potential impacts during Site 6 development to human health, the environment and environmental values.
Undertaking appropriate monitoring to check the effectiveness of management measures implemented and to assess the extent and impacts of any contamination.	Section 10  Appendix C	Section 10.3 provides information for sampling of imported materials. Section 10.4 provides sampling requirements for material transferred to Site 6 from other areas of the airport estate. Section 10.7 and 10.8 provide sampling requirements for the characterisation of material destined for offsite disposal or reuse elsewhere within the airport estate. Section 10.9 describes sampling requirements to verify that re-infiltration of dewatering effluent does not have a negative impact on soils within Site 6. Additional information pertaining to the sampling of PFAS impacted material is provided in Appendix C.



PFAS National Environmental Management Plan (HEPA, January 2018)	PCMP Section	Comment
Ensuring proper disposal of PFAS-contaminated waste, for example, by properly characterising waste and sending it to a facility licensed to accept it. Dilution is not acceptable for example in soil, compost or other products	Section 10	Section 10.7 provides procedures for the assessment requirements for disposal of material to an offsite facility. Section 10.8 provides procedures for the assessment requirements for material proposed to be used within other areas of the airport estate. Section 10.9 provides management procedures for the re-infiltration of PFAS impacted dewatering effluent.
Ensuring environmental regulators and any persons or organisations likely to be adversely affected by any releases are promptly advised of any incidents and contamination.	Section 5	Section 5.2 provides details of incident reporting.

### Consistency of the PCMP with the National Environment Protection (Assessment of Site Contamination) Measure 1999

#### Principles for the Remediation & Management of Contaminated Sites

National Environment Protection (Assessment of Site Contamination) Measure 1999	PCMP Section	Comment
<b>Prevention</b>		
Contamination, or further contamination, of a site should be prevented. Steps need to be taken to minimise the creation of additional contaminated sites and to prevent the further contamination of already contaminated sites.	Section 10	Section 10 describes the management/control measures to be implemented to prevent contamination or deterioration of the current environmental quality of Site 6.
Appropriate precautionary measures need to be taken when decommissioning industrial premises and developing sites where potentially contaminating activities have taken place.	n/a	Site 6 is not an industrial premise and has not been historically used for contaminating land use activities.
<b>Management</b>		
Contaminated site management strategies should reflect the need to protect all segments of the environment, both biological and physical (air, land and water, including groundwater). During the assessment and remediation of sites, there should be appropriate controls in place to control emissions to air, land and water.	Section 10	Section 10 describes the management/control measures to be implemented to prevent contamination or deterioration of the current environmental quality of Site 6.
The fundamental goal of remediation should be to render a site acceptable and safe for long-term continuation of its existing use or proposed use where a change of land use is part of the remediation strategy. and maximise to the extent practicable its potential future uses.	n/a	The development of Site 6 is not a remediation project.
Clean-up should not proceed if the process is likely to create a greater adverse effect than leaving the site undisturbed. This decision would need to be revised in the	n/a	The development of Site 6 is not a remediation project.



National Environment Protection (Assessment of Site Contamination) Measure 1999	PCMP Section	Comment
light of new technologies or clean-up strategies becoming available.		
A multi-disciplinary approach is essential to the effective clean-up of contaminated sites.	n/a	The development of Site 6 is not a remediation project.
Consideration must be given to public and occupational health and safety in the development of any strategy to assess, remediate and manage a contaminated site.	Section 10	In addition to the protection of environmental health and environmental values, the management measures outlined in Section 10 are also designed to mitigate potential impacts to human health associated with the inappropriate handling of contaminated materials.
<p>The preferred hierarchy of options for site clean-up and management is:</p> <ul style="list-style-type: none"> <li>i. on-site treatment of the soil, so that the contaminant is either destroyed or the associated hazard is reduced to an acceptable level.</li> <li>ii. off-site treatment of excavated soil, so that the contaminant is either destroyed or the associated hazard is reduced to an acceptable level, after which it is returned to the site.</li> </ul> <p>If it is not possible for either of the two above options to be implemented, then other options for consideration should include:</p> <ul style="list-style-type: none"> <li>i. removal of contaminated soil to an approved site or facility, followed by (where necessary) replacement with clean fill.</li> <li>ii. isolation of the contamination on-site in an appropriately designed and managed containment facility.</li> <li>iii. a less sensitive land use to minimise the need for remedial works which may include partial remediation.</li> <li>iv. Leaving contaminated material in-situ providing there is no immediate danger to the environment or community and the site has appropriate management controls in place.</li> </ul>	n/a	The development of Site 6 is not a remediation project.
In cases where a limited number of highly localised “hot-spots” are involved, responsible authorities may agree to mixing these with clean soil or subsoil to reduce the concentration of contaminants to acceptable levels. However, it should be emphasised that this is not seen as a preferred clean-up strategy.	n/a	The development of Site 6 is not a remediation project.
Contaminated soil should be regarded as potentially hazardous waste and as such should be subject to the same controls over its use, storage, transport and ultimate disposal as industrial waste.	Section 10	Section 10 provides management measures for the handling, storage, transport and disposal of contaminated soil.



## C. PFAS Impacted Material Reuse Decision Framework

### NEMP 2.0

An updated PFAS NEMP (NEMP 2.0) is expected to be released in early 2019 and will include a decision tree for the initial screening of low-level PFAS impacted soil for reuse. It is understood that the NEMP 2.0 will include consideration of whether the PFAS concentrations in the material proposed for reuse are lower than background concentrations in and around the proposed reuse location. Once released, the NEMP 2.0 should be consulted and the recommendations within this document updated as appropriate.

### NEMP Generic Reuse Considerations for PFAS Impacted Soils

The current PFAS NEMP provides general guidance for the reuse of PFAS impacted soils, but in practical terms, a site-specific assessment is required for any soils with PFAS detected above Limits of Reporting.

### Potential Acceptable Reuse Scenarios in Accordance with PFAS NEMP

NEMP specifies that the following uses may be appropriate for the reuse of PFAS impacted materials:

- use as fill material in commercial/industrial developments with minimal access to soil,
- use as fill beneath sealed surfaces, including (but not limited to) carparks, roads, paving and runways,
- use as construction fill on road embankments, noting that risks should be assessed for stormwater runoff that may mobilise PFAS,
- use as fill material in areas where background PFAS levels present a similar or higher contamination risk profile, providing that the volume of contaminant in the soil to be added is substantially less than the total mass of the contamination already present in that area, and
- use as construction material, e.g. bricks, rammed earth and gabions, noting the need to consider PFAS leachability.

The reuse of the minimally PFAS impacted materials within Site 6 is consistent with potential acceptable reuse scenarios outlined in NEMP, as Site 6 is proposed for commercial/industrial development with minimal access to soil, and materials will be located beneath sealed surfaces.

### Potential Unacceptable Reuse Scenarios in Accordance with PFAS NEMP

NEMP stipulates that contact with the environmental regulator must be made before any proposal for the following uses is made:

- fill or burial less than 2.0 metres above the seasonal maximum groundwater level,
- reuse within 200 metres of a surface water body or wetland area,
- reuse of soil or other solid waste, and water in (or in the vicinity of and able to be transported to) areas which can be identified with any of the nine matters of national environmental significance protected under the EPBC Act, and areas of environmental significance as identified in specific jurisdictions,
- fill, burial or reuse in locations potentially affected by reasonably foreseeable future rises in groundwater or sea level, or near stormwater drains,
- reuse on agricultural land,
- reuse as fill in residential developments,
- reuse as fill on public open space, parkland and recreational land, and
- inclusion in compost, fertilisers or soil conditioners.





As the SMD alignment within the site is proposed to be piped, precluding interaction with soil and groundwater, only dot point 1 above is considered relevant in the assessment of PFAS impacted material reuse within Site 6. Groundwater depth at Site 6 in relation to material reuse is considered further below.

### Site Specific Risk Assessment for Reuse of PFAS Impacted Materials at Site 6

NEMP requires that a number of factors should be considered when assessing the potential reuse of PFAS impacted materials. These factors are summarised below in relation to the environmental conditions at Site 6.

#### Site 6 Background PFAS Conditions and Added Contaminant Mass

When considering suitability of materials for reuse, NEMP requires that the potential for pre-existing 'background' PFAS impacts at the destination site and potential to add to the overall mass of PFAS in the receiving area is considered.

Site 6 is located within the Perth Airport estate, which has wide-spread PFAS impacts to soil and groundwater. The Site 6 PSI (JBS&G, 2018) indicated that it was not a primary source of PFAS impacts, and as such the site's contribution to the overall PFAS contaminant mass within the estate is considered to be negligible.

Sampling completed during historical environmental investigations and reviewed during the PSI confirmed minor PFAS impacts (below adopted assessment criteria) to soils within Site 6, and PFAS impacts to groundwater beneath the site at concentrations exceeding drinking and recreational water assessment criteria.

Background PFAS concentrations in soil for the site have been calculated by utilising the average value of soil sampling completed within Site 6. The results of samples collected from within the area of historical uncontrolled filling have been excluded from the calculation. Concentrations which were less than the laboratory limit of reporting have been considered as the limit of reporting.

Management measures stipulated in the PCMP require that any material imported to Site 6 does not exceed the calculated 'background' concentrations of PFAS. The reuse of Site 6 materials within Site 6 is not considered to represent a negative net environmental result for the site. In fact, the proposed sealing of the site during development will minimise the potential of any remnant PFAS in soil to leach, lessening ongoing impact to groundwater.

In the absence of sufficient leachable PFAS data from Site 6, the drinking water guidelines for PFAS have been adopted as reuse criteria.

Table C1: Calculated Background PFAS Concentrations in Soil

PFAS Compound	Unit	Calculated Background Concentration
Perfluorooctanoic acid (PFOA)	µg/kg	0.45
Perfluorohexanesulfonic acid (PFHxS)	µg/kg	0.56
Perfluorooctanesulfonic acid (PFOS)	µg/kg	1.97
PFHxS + PFOS	µg/kg	2.42
Leachable PFHxS + PFOS	µg/L	0.07
Leachable PFOA	µg/L	0.56

#### Increased Potential for Harm

When considering the suitability of materials for reuse, NEMP requires that if the receiving environment already contains PFAS, it be considered whether the addition of more PFAS to that system increases the potential for harm



Site 6 is located within the Perth Airport estate, which has wide-spread PFAS impacts to soil and groundwater. The Site 6 PSI indicated that it was not a primary source of PFAS impacts, and as such the site's contribution to the overall PFAS contaminant mass within the estate is considered to be negligible.

Management measures in the PCMP stipulate that materials may not be used within the site that exceed the calculated background concentrations as presented in Table C1.

The reuse of Site 6 materials within Site 6 is not considered to represent a negative net environmental result for the site. In fact, the proposed sealing of the site during development will minimise the potential of any remnant PFAS in soil to leach, lessening ongoing impact to groundwater.

## Land Use

NEMP requires consideration of the current and likely future land uses of the destination site, when assessing the suitability of material for reuse.

Site 6 is proposed for commercial/industrial development. The Site 6 location within the airport estate renders conversion to more sensitive land uses in the future unlikely.

## Hydrogeology

When assessing the suitability of materials for reuse, NEMP requires that the hydrogeology at the destination site be considered.

Regional groundwater is known to flow in a general north-westerly direction, toward the Swan River. Peak groundwater beneath Site 6 is recorded to be 1.8 m to 2.2 m bgl, consistent with the peak groundwater levels identified in Perth Groundwater Atlas as from 2.8 m bgl in the southern area of the site, to 1.8 m bgl in the northern most areas of the site.

The results of historical investigations have confirmed that concentrations of PFAS in groundwater beneath Site 6 and the Airport estate in general exceed adopted assessment criteria.

NEMP specifies that placement of PFAS impacted material within 2 metres of peak groundwater levels requires site-specific consideration, in consultation with regulators.

Based on the depth to groundwater beneath the majority of Site 6 being in excess of 2 m bgl, it is considered that the depth to groundwater does not preclude the reuse of PFAS impacted material within Site 6.

Additionally, the concentrations of PFAS identified within soils in Site 6 are minimal, and the reuse of these materials is considered to have a negligible contribution to the PFAS contaminant mass in the area overall. In fact, the proposed sealing of the site during development will minimise the potential of any remnant PFAS in soil to leach, lessening ongoing impact to groundwater.

The management measures presented in the PCMP stipulate that PFAS concentrations in imported materials must not exceed calculated background PFAS concentrations for Site 6. As a conservative measure, reuse of PFAS impacted materials (derived from within Site 6 or from other areas within the airport estate) should be placed within areas of Site 6 with the highest topographical elevation, wherever practicable, to maximise distance between impacted materials and groundwater.

## Proximity of Site 6 to Sensitive Environmental Receptors

NEMP requires that the proximity of the destination site to pathways such as open drains, storm water systems, water bodies and to sensitive environmental receptors, groundwater-dependent ecosystems and sensitive animals be considered when assessing the suitability of material for reuse.

Site 6 is not located in the immediate vicinity of sensitive environmental receptors. The portion of the Southern Main Drain (an open drainage channel) that is located within the site is proposed to be piped as part of the development, precluding interaction with PFAS impacted groundwater or potential migration of PFAS impacted soils/soil leachate in surface waters.



## Mobilisation of PFAS

NEMP requires that the potential for the receiving environmental conditions to accelerate mobilisation of PFAS in the contaminated material or in existing PFAS at that site be assessed when considering the suitability of material for reuse.

The proposed sealing of the site during development will minimise the potential of any remnant PFAS in soil to leach, lessening PFAS mobility and ongoing impact to groundwater.

### Summary

In summary it is considered that the reuse of PFAS impacted materials derived from within Site 6 or from other areas within the airport estate will not result in deterioration of the environmental quality of Site 6 or surrounds, provided the prescribed management measures within the PCMP are adhered to.

## Reuse of PFAS Contaminated Water

NEMP specifies that the key consideration for reuse of PFAS impacted groundwater is that the proposed reuse must not result in an unacceptable or increased risk to human health and/or the environment.

NEMP indicates that following consultation with relevant regulators, acceptable reuse options may include:

- irrigation of non-edible crops,
- dust suppression,
- re-infiltration,
- managed aquifer recharge, and
- industrial process water.

It is considered that the re-infiltration of dewatering effluent derived from Site 6 within Site 6 is consistent with the above potentially acceptable reuse options.

NEMP also specifies that where reuse involves the discharge of PFAS-contaminated water to land, the risk assessment should not only consider the potential for PFAS transport to off-site sensitive receptors, but also the potential for long-term build-up of the total PFAS mass in the receiving soils, groundwater and plants.

The PCMP specifies that the re-infiltration sumps must be sampled by an appropriately qualified environmental professional before re-infiltration occurs, and subsequent to the cessation of de-watering and re-infiltration activities, to assess whether the activity has resulted in an increase in PFAS concentrations to soil within the re-infiltration sump. Any impacts identified must be remediated and validated in accordance with the management measures specified in the PCMP.

## Sampling of Stockpiled Material for PFAS

Assessment of material excavated from Site 6 will be required where reuse at other areas within the airport estate is proposed, and for materials imported for use within Site 6 which are not accompanied by adequate documentation of their Clean Fill or Uncontaminated Fill status.

### Stockpiled Soil Testing

Stockpile testing must be undertaken at a sufficient density to adequately characterise the material, in accordance with the NEPM (NEPC 2013).

Stockpile samples should be collected in accordance with EPA Victoria 2010 guidelines, as referenced in the NEPM (NEPC 2013), which stipulates using a systematic three-dimensional grid to account for spatial variability. Surface sampling from the stockpile will not be sufficient to categorise its contents. Sampling should be uniformly distributed throughout the stockpile, including sampling at depth. Collection of samples from the exterior 300 mm of the stockpile should be avoided due to the higher risk of weathering and grain size grading errors.



Soil samples must be collected and handled in accordance with NEPM (NEPC 2013) and NEMP (HEPA 2018), including the collection of appropriate QA/QC samples.

All soil testing should be carried out by a laboratory accredited by the National Association of Testing Authorities (NATA) for analysis of PFAS in soils.

This advice relates specifically to PFAS contamination, but it is recommended that the presence of other contaminants is also assessed in this manner.

It is recommended that any material found to contain considerably elevated PFAS concentrations during the regular stockpile testing undertaken as material is excavated, is segregated and stored separately from the main stockpiles.

### Leachability Testing

Soil samples must be subjected to leachability testing, since the generation of leachate is the most significant potential pathway for migration of PFAS into groundwater beneath the site.

Leachability testing should be undertaken in accordance with guidance in NEPM Schedule B3 Section 12, which recommends the Australian Standard Leaching Procedure (ASLP) for the assessment of contaminants in soil.

The assessment of ecological risk from leachable concentrations of PFAS should be based on an appropriate level of species protection for the proposed reuse site. Unless otherwise agreed with Perth Airport, it is recommended that the 99% species protection levels for freshwater is adopted, given the propensity for PFAS to bioaccumulate, and the sensitive ecological receptors on site and in close proximity to the site.

### Considerations for the Transport of PFAS Impacted Material

Information provided in the NEMP regarding the transport of PFAS contaminated materials is summarised in this section.

Until the National Environment Protection (Movement of Controlled Waste between States and Territories) Measure 1998 (Movement of Controlled Waste) NEPM is reviewed, environmental regulators will adopt the following PFAS-specific waste code within their legislative frameworks based on the following:

Category: Organic chemical (M)

Description: Per- and poly-fluoroalkyl substances (PFAS) contaminated materials, including waste PFAS-containing products and contaminated containers.

Waste Code: M270

The associated waste descriptions must include a reference to the PFAS present, sufficient to accurately reflect the nature of the waste. Where multiple waste codes apply, the waste must be reported using the description 'Per- and poly-fluoroalkyl substances (PFAS) contaminated materials, including PFAS-containing waste products and contaminated containers'.

PFAS-contaminated materials, including waste PFAS-containing products are considered to be Dangerous Goods Class 9.

As required for the movement of contaminated materials, decontamination of vehicles and transport containers is important to eliminate contamination of subsequent loads. Containers must be managed as PFAS-contaminated materials until they have been appropriately cleaned.



## D. Unexpected Finds Procedure

### Purpose

The purpose of this Unexpected Finds Procedure is to provide guidance on the management of unexpected finds which, for the purposes of the project, are defined as material comprising contamination that may lead to environmental pollution or cause human harm e.g. asbestos, hydrocarbon impacted soils, PFAS impacted materials (at concentrations greater than those considered to be background for Site 6) chemical odours, refuse, buried drums etc. identified based on visual/olfactory evidence and / or analytical results which indicates that the material does not conform to general site expectations.

### Process

Should unexpected finds be encountered, the following procedures will be followed:

- Stop work and make the area secure, including notifying other workers in the immediate area.
- If potential asbestos containing material is observed, then the excavation area should be isolated and managed as per the procedures listed in the Asbestos Management Procedure.
- Unexpected potentially contaminated material will be excavated and separately stockpiled in a secure location on strong impermeable plastic sheeting and covered top and sides with securely fitted plastic sheeting.
- The stockpile will be protected by adequate sediment controls to collect runoff and prevent overland stormwater flow from affecting the base of the stockpile.
- Potentially contaminated materials from different parts of the construction area will be segregated into separate stockpiles. The separate stockpiles should be signposted and the source location of the materials on site recorded.
- When the potentially contaminated material has been removed, the area from which this material was excavated will also be isolated. Further excavation or other construction work will not occur in that area until advice from a suitably qualified environmental consultant is provided confirming that any contaminated material has been removed and that the area is suitable for further excavation or construction activity.
- The location from which potentially contaminated materials is excavated and the location of the stockpile of excavated material will be recorded on a site plan. Records will include an outline of the area and depth of the potentially contaminated materials and the volume of material excavated.
- A suitably qualified environmental consultant will be engaged to provide interim advice based on visual inspection on construction health and safety, material storage and material disposal to allow construction to proceed as soon as practicable.
- Characterisation of material will be conducted in accordance with the requirements of the PCMP.

**Note:** consistent with agreed international approaches, if waste material contains >50 mg/kg PFOS the waste must be treated using a technique that will destroy or irreversibly transform the PFOS. Based on concentrations of PFAS (including PFOS) identified in soils within Site 6 during historical investigations, it is considered very unlikely that materials with this level of PFAS impact will be identified during the proposed development/construction works. However, in the event such materials are identified, this Unexpected Finds Procedure must be followed to ensure materials are stored and disposed of in an environmentally sound manner that will achieve nil environmental release of their PFAS content.





## E. Asbestos Management Procedure

### Purpose

The purpose of the Asbestos Management Procedure is to manage risks related to the disturbance of asbestos contamination to minimise potential health impacts to human receptors during construction activities.

This procedure will be incorporated by the successful contractor (as part of the CEMP) prior to the commencement of works, to reflect roles and responsibilities and any updated understanding of the works to be conducted at the site.

### Scope

This procedure applies to the disturbance of asbestos containing material (ACM), asbestos fines and asbestos fibres potentially present in soils at the site. This procedure in conjunction with the earthworks program should be regularly reviewed to refine the management measures required to be implemented on a case by case basis, to account for site conditions at the time.

### Definitions

Term	Definition
Asbestos	<p>The asbestiform variety of any mineral silicate belonging to the serpentine or amphibole group of rock-forming minerals, and includes the asbestiform variety of the following:</p> <ul style="list-style-type: none"> <li>• actinolite;</li> <li>• grunerite or amosite (known as brown asbestos);</li> <li>• anthophyllite;</li> <li>• chrysotile (known as white asbestos);</li> <li>• crocidolite (known as blue asbestos); and</li> <li>• tremolite.</li> </ul> <p>Asbestos is a Class 1 carcinogen (known to cause cancer) with the main risk to health being through inhalation of respirable fibres.</p>
Asbestos Containing Material (ACM)	<p>Asbestos Containing Material (ACM) is in sound condition, although possibly broken or fragmented, and the asbestos is bound in a matrix; for instance, asbestos cement fencing. This is also restricted to material that cannot pass through a 7mm x 7mm sieve. ACM usually represents a low human health risk if it has not been weathered or crushed/abraded and is handled intact.</p>
Asbestos Fines (AF)	<p>Asbestos fines (AF) includes free fibres of asbestos, small fibre bundles and also ACM fragments that pass through a 7mm x 7mm sieve. Both FA and AF have the potential to generate or be associated with free asbestos fibres, which can pose a considerable inhalation risk if made airborne.</p>
Fibrous Asbestos (FA)	<p>Severely weathered ACM and asbestos in the form of loose fibrous material such as insulation products. Friable asbestos is defined by the Department of Health (DoH) as asbestos material that is in a degraded condition such that it can be broken or crumbled by hand pressure. Examples of friable asbestos include, but are not limited to, asbestos lagging, sprayed insulation, millboard, felt and woven asbestos matting. Both ACM and FA can often be detected visually.</p>
Asbestos Impacted Soils	<p>Soils that are impacted by asbestos containing material, asbestos fines and fibrous asbestos.</p>



## Management Measures

Soils known to or suspected to be impacted by asbestos (ACM, AF, FA) should not be disturbed without undertaking the following management procedures. These actions should be implemented in conjunction with general dust and air quality control actions described in the contractor's CEMP.

Measure	Actions
Site Induction	<ul style="list-style-type: none"> <li>All personnel involved with site works shall be given a site induction by a suitably qualified person.</li> <li>All personnel involved in subsurface excavations works will complete a work activity induction (in the form of a Safe Work Method Statement (SWMS) or equivalent) and be provided with a copy of this Asbestos Management Procedure.</li> <li>All on site personnel will be inducted to be made aware of the possible presence of asbestos associated with the area of historical uncontrolled filling or areas of fly-tipping, the potential health risks and the expectations to manage the potential health risks to them and their co-workers.</li> <li>All on site personnel will be provided with and trained in the use of Personal Protective Equipment (PPE), as determined by their role, and access to the site and as determined by a suitable risk assessment.</li> </ul>
Access	<ul style="list-style-type: none"> <li>If asbestos is confirmed / suspected to be present, the excavation area shall be barricaded to establish an exclusion zone from the remaining site with suitable barriers. The location and extent of any exclusion zones should be established in accordance with NOHSC:2002 (2005) Code of Practice for the Safe Removal of Asbestos guidelines. The extent of controlled areas will be set with the objective of preventing unacceptable exposures to personnel working in other areas of the site while maintaining the operational efficiency of the overall site.</li> <li>The exclusion zone will be signposted with warning signs to prevent unauthorized entry and disturbance. Signage is required to comply with NOHSC:2018 (2005) and Australian Standard 1319 Safety Signs for the Occupational Environment.</li> <li>All barriers are to remain in place until intrusive works have been completed and all contaminated soil has been appropriately remediated and/or managed.</li> <li>Where possible, the number of personnel working in an exclusion zone shall be kept to a minimum.</li> </ul>
Personal Protective Equipment	<ul style="list-style-type: none"> <li>The minimum protective equipment required to be worn by personnel working within the exclusion zone and outside of mobile plant or truck cabins will be disposable overalls and a personal air-purifying respirator. The filter type within the respirator should be Class P1 or P2, as stipulated in the Code of Practice for the Safe Removal of Asbestos, 2nd Edition [NOHSC:2002(2005)]. This PPE is in addition to standard site/task specific PPE.</li> <li>The enforcement of a clean-shaven policy shall be in place for subcontractors directly involved in the removal of ACM as dictated by a suitable risk assessment.</li> </ul>
Decontamination	<p>Where friable asbestos (FA) or asbestos fines (AF) contamination has been identified, soil excavation work will require decontamination of workers, equipment and the work area. The type of material and task performed will dictate the type of decontamination required, this will be determined in consultation with an appropriately qualified subcontractor.</p> <p>The following measures may be implemented as determined by a suitable risk assessment:</p>



Measure	Actions
	<ul style="list-style-type: none"> <li>• A dedicated decontamination area will be established at the entry/exit point of the exclusion zone.</li> <li>• All contaminated materials, including plastic sheeting and PPE etc. must be disposed of as asbestos waste [NOHSC:2018(2005)] within heavy duty (0.2mm thick) polyethylene bags marked as asbestos waste in line with NOHSC:2018 (2005). The bags will be sealed with string or tape at the end of each day and transferred to a dedicated asbestos disposal container.</li> </ul> <p>The following procedures have been written utilising the decontamination procedures outlined in the Code of Practice for the Safe Removal of Asbestos NOHSC:2002 (2005).</p> <ul style="list-style-type: none"> <li>• At the end of removal work, all tools should be decontaminated in the following manner:                         <ul style="list-style-type: none"> <li>› Decontaminated using wet or dry decontamination methods as outlined in the NOHSC Code of Practice for the Safe Removal of Asbestos NOHSC:2002 (2005) (i.e. fully dismantled and cleaned under controlled conditions), or</li> <li>› Placed in sealed containers (and used only for asbestos removal work), or</li> <li>› Disposed of as asbestos waste.</li> </ul> </li> <li>• If tools cannot be decontaminated within the asbestos work area, or are to be re-used on another project, they should be tagged to indicate possible contamination and double bagged in asbestos waste bags before being removed from the asbestos work area.</li> <li>• Personal decontamination must be undertaken each time employees leave the asbestos work area (NOHSC:2002 (2005)). This should occur within the asbestos work area so as to not transport material off site but should be located within an area where re-contamination is minimised.</li> <li>• Throughout the asbestos removal process, asbestos contaminated PPE should not be transported outside the asbestos work area except for disposal purposes.</li> <li>• Before work clothes and footwear worn during asbestos work are removed from the work area, they should be thoroughly vacuumed with an asbestos vacuum cleaner to remove any asbestos fibres, and footwear should be wet wiped.</li> <li>• Personal respiratory protective equipment should continue to be worn until all contaminated disposable coveralls and clothing has been vacuumed and/or removed and bagged for disposal; and personal washing completed.</li> <li>• For personnel involved in the removal of contaminated material, personal food hygiene practices shall be adhered to with designated smoking sheds and access to showers.</li> <li>• To prevent the spread of contaminated material back into remediated areas, a vehicle wash-down area will be provided on the exit route from contaminated areas to remove any soil adhering to vehicle tyres/tracks and undercarriage.</li> <li>• If required, vehicles leaving the exclusion zone will be cleaned by low pressure water sprays and brushing where necessary.</li> <li>• Any sediments which accumulate in the wash-down area will be considered waste and will be disposed of offsite to landfill after sampling and analyses to determine contaminant levels.</li> <li>• Any wastewater from the washing process will either be disposed of offsite in accordance with the Environmental Protection (Controlled Waste) Regulations (2004) or directed to a lined evaporation pond and the sediment subsequently</li> </ul>



Measure	Actions
	<p>scraped and disposed of offsite to landfill after sampling and analyses to determine contaminant levels.</p> <ul style="list-style-type: none"> <li>The area will be validated in accordance with DoH (2009) guidelines to confirm no residual asbestos is present in shallow soils.</li> </ul>
Excavation Methodology	<ul style="list-style-type: none"> <li>Prior to excavation, all confirmed asbestos impacted soils will be moistened, either through natural rainfall or light application of water.</li> <li>Excavated material will be earth worked in a manner which minimises potential release and spread of asbestos by not dropping loads from heights, controlling speed of onsite mobile plant, minimising the number and surface area of any temporary stockpiles of between its excavation and loading point.</li> <li>All waste intended to be disposed of off site is required to be characterised, tracked and disposed of in accordance with the PFAS and Contamination Management Plan (PCMP) and Materials Tracking System.</li> <li>Asbestos containing materials removed from the site will be disposed of to a landfill licensed to accept asbestos waste in accordance with the Landfill Waste Classifications and Waste Definitions (DEC 1996 as amended 2018).</li> </ul>
Airborne Asbestos Fibre Monitoring (where required – if FA or AF identified)	<ul style="list-style-type: none"> <li>The potential presence of airborne asbestos fibres will be monitored using personal air samplers on a select number of personnel working within with the exclusion zones. Monitoring shall be undertaken on personnel as dictated by their exposure profile and in accordance with the Occupational Exposure Limit (OEL).</li> <li>The personal air samplers will be used in consultation with occupational testing procedures and sampling will be undertaken for no less than eight hours during each day ground disturbing works are being undertaken in areas that have not been verified as being free of asbestos. This form of monitoring is known as exposure monitoring and involves the taking of regular samples within the breathing zone to determine a person's risk from, or level of exposure to, airborne asbestos fibres. The results of this sampling can then be used to determine compliance with asbestos exposure standards and amend work procedures as appropriate.</li> <li>In addition, static air samplers will be strategically located on the boundaries of the exclusion to assess the effectiveness of controls within the working area. This type of sampling is known as control monitoring and is often conducted in areas that contain high proportions of non-asbestos fibres or particles.</li> <li>Static air monitors run cycle will depend on the duration of the works and flow rates will be adjusted accordingly. If works are required over a full day, static air monitors will run on a 7hr cycle (8am-4pm) each day ground disturbing works are being undertaken in areas that have not been verified as being free of asbestos. All samples will be processed at an appropriately accredited laboratory on a 24hr/next working day turnaround. If for any reason samples fail to reach the laboratory in time, then samples will be analysed on a 48hr/two working day turnaround. The reason for failure to deliver the samples on the day will be required to be reported by the Environmental Coordinator within 24hrs of becoming aware of the event.</li> </ul> <p>The applicable standards for monitoring asbestos are provided in Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres 2nd Edition [NOHSC:3003(2005)], the Code of Practice for the Safe Removal of Asbestos [NOHSC:2018(2005) and the Occupational Safety and Health Regulations 1996.</p> <p>The National Exposure Standard (NES) as established by the Australian Safety and Compensation Council (ASCC, formerly the NOHSC), is 0.1fibres/mL of air measured using the membrane filter method for all forms of asbestos.</p>



Measure	Actions												
	<p>Table F1 below (taken from NOHSC:2002(2005)) defines the 'control levels' of airborne asbestos fibre concentrations which, if exceeded within the filters of the personal air samplers, will instigate a series of actions to rectify the situation.</p> <p>Table F1: Control Levels for Airborne Asbestos Fibre Concentrations in Personnel Samplers</p> <table border="1" data-bbox="429 445 1350 779"> <thead> <tr> <th data-bbox="429 445 611 521">Control Level (f/mL)</th> <th data-bbox="611 445 1350 521">Control/Action</th> </tr> </thead> <tbody> <tr> <td data-bbox="429 521 611 629">&lt;0.01</td> <td data-bbox="611 521 1350 629">Continue with Control Measures e.g. dust suppression around excavations and stockpiles, minimise ground disturbance and asbestos breakage</td> </tr> <tr> <td data-bbox="429 629 611 736">≥0.01</td> <td data-bbox="611 629 1350 736">Review Control Measures e.g. increase dust suppression, postpone works until weather conditions are favorable.</td> </tr> <tr> <td data-bbox="429 736 611 779">≥0.02</td> <td data-bbox="611 736 1350 779">Stop works, find and address the cause</td> </tr> </tbody> </table> <p>In terms of protecting public health, the target background level within the three static air samplers will be the NATA collection and detection limit of 0.01f/mL (10 times below the occupational limit). Excavation/loading activities within the exclusion zone will cease while dust management procedures are reviewed if this target criterion is exceeded. Table F2 outlines the asbestos fibre air quality criteria for the static air samplers.</p> <p>Table F2: Target Levels for Airborne Asbestos Fibre Concentrations in Static Air Samplers</p> <table border="1" data-bbox="429 1099 1350 1178"> <thead> <tr> <th data-bbox="429 1099 868 1137">Target Criteria (f/mL)</th> <th data-bbox="868 1099 1350 1137">Work Stoppage Criteria (f/mL)</th> </tr> </thead> <tbody> <tr> <td data-bbox="429 1137 868 1178">&lt;0.01</td> <td data-bbox="868 1137 1350 1178">0.01</td> </tr> </tbody> </table>	Control Level (f/mL)	Control/Action	<0.01	Continue with Control Measures e.g. dust suppression around excavations and stockpiles, minimise ground disturbance and asbestos breakage	≥0.01	Review Control Measures e.g. increase dust suppression, postpone works until weather conditions are favorable.	≥0.02	Stop works, find and address the cause	Target Criteria (f/mL)	Work Stoppage Criteria (f/mL)	<0.01	0.01
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**Asbestos Management Procedure References**

Department of Health (DoH) (2009) Guidelines for the Assessment, Remediation and Management of Asbestos Contaminated Sites in Western Australia

Environmental Protection (Controlled Waste) Regulations (2004)

Occupational Safety and Health Regulations (1996)

National Environmental Protection Council (NEPC) (1999) National Environment Protection (Assessment of Site Contamination) Measure, 1999 as amended 2013

National Occupational Health and Safety Commission (NOHSC):2002 (2005) Code of Practice for the Safe Removal of Asbestos, 2 Edition, April 2005

National Occupational Health and Safety Commission (NOHSC):2018 (2005) Code of Practice for the Management and Control of Asbestos in the Workplaces, April 2005

National Occupational Health and Safety Commission (NOHSC):3003 (2005) Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres, 2 Edition, April 2005

