

Perth Airport 

Master Plan 2020

APRIL 2020







Section 9: **Environment Strategy**

Perth Airport is committed to ensuring that our services are delivered to the community and our business partners in a sustainable manner to deliver positive outcomes for today and the future.



9.1 Introduction

Perth Airport’s approach to environmental management and sustainability is outlined in the Environmental and Sustainability Management Framework (ESMF), which also incorporates measures to meet the airport’s obligations under Commonwealth and State legislation (where applicable). The Environment Strategy presented in this Master Plan 2020 builds on Perth Airport’s ESMF.

Similarly, Aboriginal heritage and engagement is addressed through Perth Airport’s Aboriginal Heritage Management Framework.

Perth Airport continually reviews its environmental processes, seeking to minimise environmental impacts from airport operations and improve sustainability outcomes.

The Environment Strategy details Perth Airport’s areas of environmental, sustainability and heritage focus and outlines actions, improvements and initiatives in a five-year action plan. In accordance with the *Airports Act 1996* (Airports Act) requirements, it includes assessment of, and strategies for, the management of identified issues over the 20-year planning period of this Master Plan 2020.

This Environment Strategy replaces the Perth Airport Environment Strategy 2014-2019, which was incorporated in the Perth Airport Master Plan 2014.

9.2 Responsibilities

Environmental management, sustainability and heritage management are the responsibility of Perth Airport, airline partners, business partners, tenants, contractors and consultants.

Perth Airport’s tenants and companies conducting activities on the estate must take all reasonable and practicable measures to prevent pollution and must comply with relevant legislation and this Environment Strategy.

In accordance with Perth Airport’s ESMF, tenants and companies conducting activities on the airport estate are required to develop an Environment Management Plan (EMP) that demonstrates how they will comply with the Commonwealth Airports (Environment Protection) Regulations 1997 (AEP Regulations). The EMP must be developed to the satisfaction of Perth Airport and be consistent with the Perth Airport Environment Management Plan Guidelines (published on the Perth Airport website, perthairport.com.au). Tenants operating under an EMP are required to provide an Annual Environment Report to Perth Airport. Tenants identified as posing minimal risk to the environment may be exempted by Perth Airport from the requirement to develop an EMP.

Where construction activities have environmental risks, an EMP must be developed and implemented by the contractor or consultant, to the satisfaction of Perth Airport, and be consistent with Perth Airport’s EMP Guidelines. This requirement applies equally to construction activities undertaken by Perth Airport and third parties.

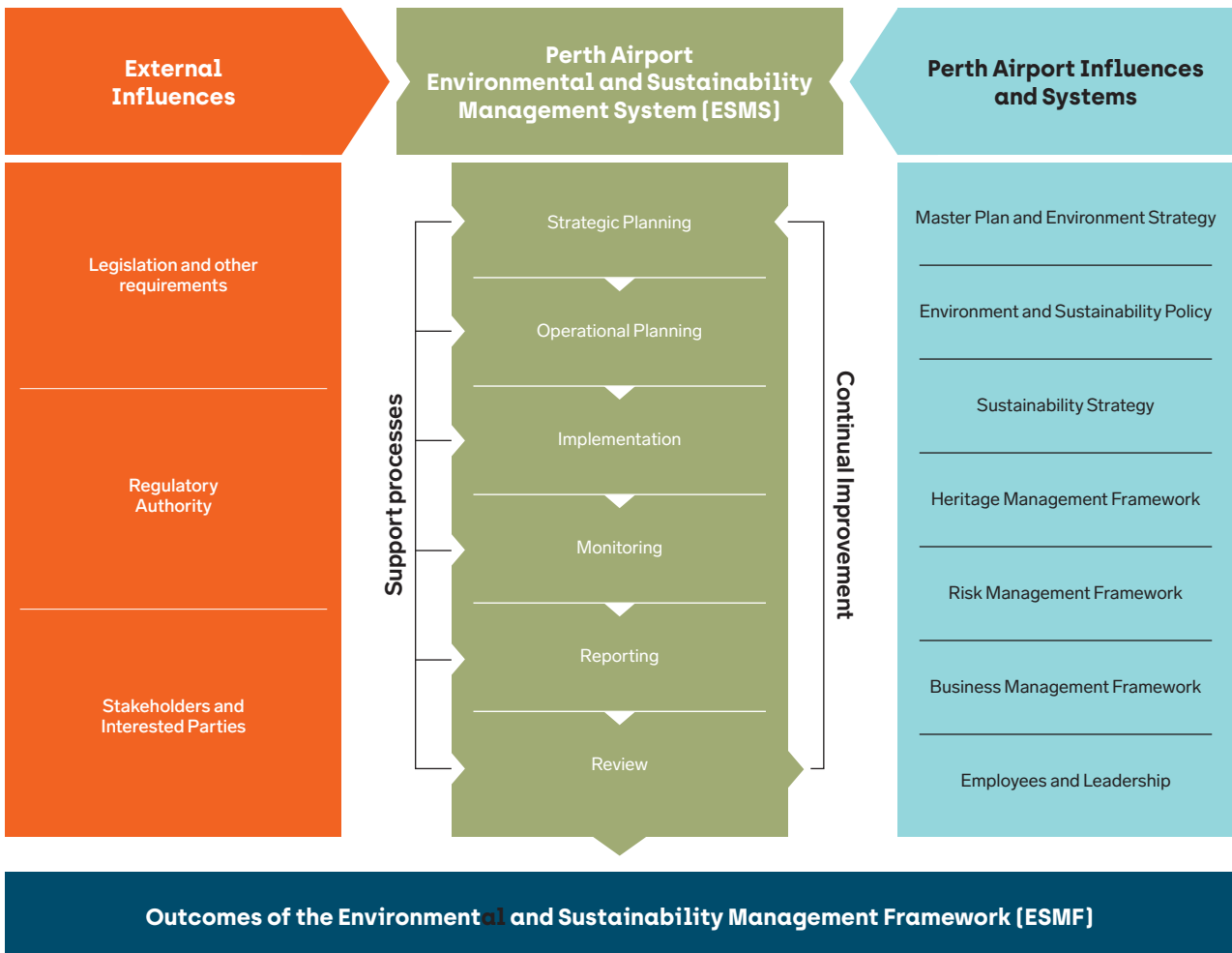


Figure 9-1 Environmental and Sustainability Management Framework
Source: Perth Airport

9.2.1 Training

To promote effective environmental, sustainability and heritage management, all Perth Airport employees are made aware of their roles and responsibilities, including conformance with policies and procedures. Training and communication processes and systems have been established, including an induction program for new employees.

Perth Airport environmental staff have appropriate industry recognised qualifications, training and experience.

9.3 Environmental and Sustainability Management Framework

Perth Airport has adopted a risk-based approach to environmental management and sustainability and implements this through the ESMF, incorporating an Environmental and Sustainability Management System (ESMS) as well as other relevant Perth Airport strategic policy and planning documents. The ESMF is presented in Figure 9-1 and describes the various external and internal interfaces and considerations. Key components of the ESMF include the following, with further details provided in the subsequent sections of this Master Plan 2020:

- Environment and Sustainability Policy,
- Sustainability Strategy,
- Heritage Management Framework,
- Environmental Management System, and
- Continuous Improvement.

9.3.1 Environment and Sustainability Policy

The Environment and Sustainability Policy outlines Perth Airport's intentions, commitments and principles in relation to environmental management and sustainability. The Policy outlines Perth Airport's commitment to requirements of the Airports Act and AEP Regulations, including continuous improvement, monitoring of environmental values on the airport, pollution prevention and providing an Annual Environment Report to the Commonwealth Department of Infrastructure, Transport, Regional Development and Communications.

The Policy is reviewed every five years by Perth Airport to ensure it is current with industry standards and appropriate for the activities undertaken at the airport. The Environment and Sustainability Policy is published on the Perth Airport website, perthairport.com.au.

9.3.2 Sustainability Strategy

Perth Airport has had a Sustainability Strategy in place since 2008. The Sustainability Strategy describes Perth Airport's commitment to operating in a sustainable manner to deliver positive outcomes for today and the future. The Sustainability Strategy provides a focus on responsible use of resources, maintaining regulatory compliance, including sustainability considerations in business practices and demonstrating and promoting sustainable practices.

In 2018, Perth Airport revised the Strategy to align with the current goals and vision for sustainability on the estate. A range of sustainability themes considered significant to Perth Airport's operations were identified in the updated Strategy. In particular, Perth Airport recognises the importance of energy and carbon emissions, waste and water management, and is prioritising action in these areas through implementation of the Sustainability Strategy.

A component of Perth Airport's proposed development and expansion includes extensive infrastructure projects, such as the new runway and a new terminal to support the consolidation of all commercial passenger services to the Airport Central Precinct by 2025. Perth Airport is committed to deliver these key projects in keeping with its Sustainability Strategy and will consider suitable frameworks for assessment and development, including the Green Building Council of Australia's Green Star framework and the Infrastructure Sustainability Council of Australia (ISCA). Additionally, Perth Airport is committed to incorporating practical sustainability initiatives into planning, procurement, construction and operation of infrastructure assets across the estate.

9.3.3 Heritage Management Framework

Perth Airport has implemented a Heritage Management Framework to guide the management of Aboriginal cultural heritage within the estate. Through the Framework, shown in Figure 9-2, Perth Airport is committed to proactively engaging with members of the Noongar community in relation to:

- projects and developments on the estate,
- management of Aboriginal sites,
- suitable storage for artefacts found on the estate,
- cultural awareness activities,
- ongoing compliance with the *Aboriginal Heritage Act 1972 (WA)*,
- facilitating economic opportunities,
- recognition of country,
- land management, and
- continued access to on-airport estate heritage sites for cultural activities.

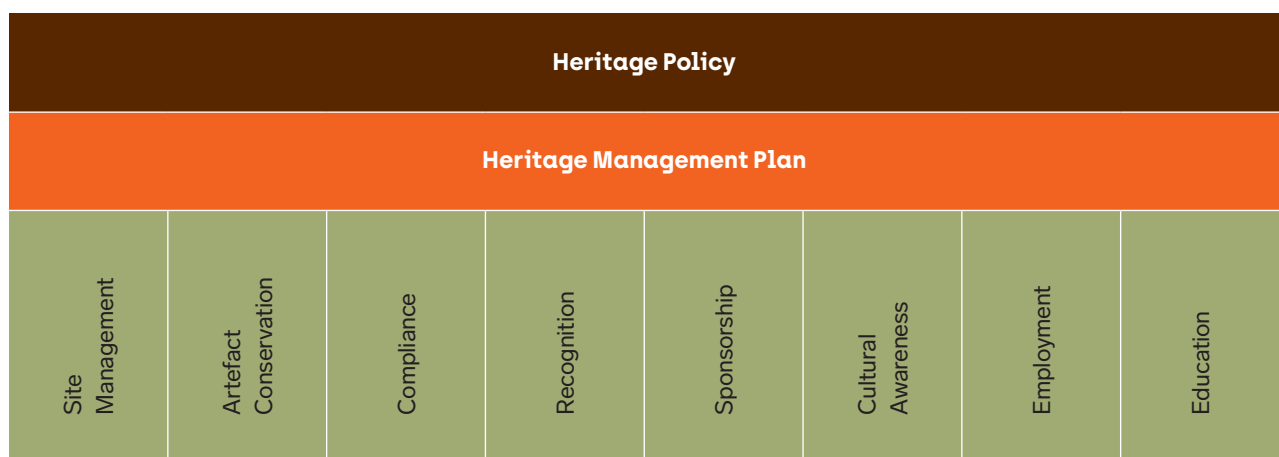


Figure 9-2 Perth Airport Heritage Management Framework

Source: Perth Airport

9.3.4 Environmental Management System

The Environmental Management System (EMS) describes how Perth Airport plans, implements, monitors, reports and reviews environmental management and sustainability related issues across all aspects of the airport estate and operations. Through this process, Perth Airport identifies environmental and sustainability risks, opportunities and constraints. The EMS, consistent with the relevant Australian and International standards, incorporates five key management processes.

Strategic Planning

Perth Airport's overall objectives and approach to environment and sustainability are defined in the Environment and Sustainability Policy, Environment Strategy and Sustainability Strategy.

Operational Planning

Several operational planning tools are used, including business plans, development approvals, risk assessments and training processes.

Implementation

Implementation of plans are achieved through systems and procedures defined in documents such as Environmental Management Plans, the Aerodrome Manual, standard work procedures and action plans.

Monitoring and Reporting

A wide range of monitoring and reporting processes are in place to satisfy Commonwealth and State regulatory requirements, and to measure the extent to which Perth Airport's environment and sustainability objectives are being met. Processes include:

- auditing – every EMP, for either construction or operational phases, is assessed to ensure Perth Airport's environment and sustainability objectives and requirements are maintained for all works on the airport estate,
- environmental monitoring – monitoring is undertaken for flora and fauna, surface and ground water, contaminated sites and ground-based noise,
- Annual Environment Report - Perth Airport submits an annual report to Department of Infrastructure, Transport, Regional Development and Communications,
- tenant management activities - tenants with an EMP are required to submit an Annual Environment Report to Perth Airport within 30 days of the end of the financial year,
- emissions reporting – Perth Airport reports as required under the National Pollution Inventory and National Greenhouse and Energy Reporting Scheme,
- environmental and heritage incident reporting and investigation,
- collection and collation of environmental incident and hazardous material spill data and reporting to the Airport Environment Officer (AEO, employed by Department of Infrastructure, Transport, Regional Development and Communications),
- regular meetings with the AEO, and
- management of the Environmental Site Register.

Table 9-1 provides a summary of the monitoring activities and the frequency undertaken by Perth Airport.

Review

Operations and activities are reviewed annually through the business improvement plan process, with the annual performance of the EMS assessed and improvement opportunities identified.



Environmental management aspect	Monitoring type	Frequency
Environmental management	Reporting to Managing Responsibly Forum	Monthly
	Internal EMS Conformance Audit	Annually
	External EMS Conformance Audit	3-yearly
Sustainability in planning and design	Qualitative review of the implementation of the ESD principles in new developments	Ongoing
	Water use	Annually
Energy and carbon	Gas use	Annually
	Fuel use	Annually
	Electricity use (overall)	Annually
	Electricity use (multiple submeters)	Annually
	Fuel usage (ground vehicles)	Annually
Hazardous materials	Underground storage tank integrity testing	As required
	Inspections of hazardous materials storage areas	Regular and ongoing – as part of tenant EMS audits
Cultural heritage	Aboriginal monitors	As required, generally project based
Tenants	Review of tenant risk ratings	Annually based on audits
	Review of tenant operational environmental management plans (OEMP)	As required
	Audit of tenants for compliance against OEMP commitments and site monitoring where required (groundwater, air emissions etc.)	Every 1-3 years based on tenant risk ratings
	Ensure environmental assessment is conducted prior to end of lease	As required
Projects	Review of construction environmental management plans (CEMP), and Acid Sulfate Soils and Dewatering Management Plans (if required)	Prior to major construction activities
	Assessment of site conditions prior to commencing major projects, including soil, groundwater and surface water (if applicable)	As required
	Audit of projects for compliance against CEMP commitments	During major construction activities
	Ensure compliance with clearing permits, soil management guidelines	As required
Estate Management	Weed management	Annually
	Feral animal control	Annually
	Dieback monitoring and treatment	Annually
Bushfire Management	Maintaining fire breaks and paddock slashing	Annually
	Prescribed burns to reduce fuel load	As required
Soil and water management	Soil quality testing	Prior to moving excavated soil
	Stormwater quality	Quarterly
	Groundwater quality	Quarterly
Biodiversity and conservation	Airside wildlife monitoring	Daily
	Flora and fauna monitoring	Prior to major construction activities
Air quality and ground-based noise	Air quality	Annually
	Ground-based noise	As required
Waste management	Bin room inspections	Regular and ongoing
	Triple interceptor traps inspections	2 yearly or following spills. Clean out as required
	Trade/greasy waste discharge monitoring	Reported annually by tenants
	Bin inspections	Ad-hoc, as part of CEMP / OEMP audits

Table 9-1 Perth Airport Monitoring

Source: Perth Airport

9.3.5 Continuous Improvement

Perth Airport's EMS adopts a continuous improvement process to ensure plans and practices are current, in line with regulatory requirements, and adequate to manage identified risks.

Perth Airport conducts regular audits, monitoring, incident investigations, risk reviews and management reviews of the EMS. Through these processes, opportunities for improvement are identified and acted upon via system changes, updates and revisions. This process ensures regular and systematic continuous improvement of environmental management and sustainability at Perth Airport.

9.4 Environmentally Significant Areas

In accordance with the Airports Act, Perth Airport has identified areas on the estate that may be considered as being environmentally significant. These areas are mapped in Figure 9-3 and include habitat for listed threatened flora shown in Figure 9-7.

Perth Airport recognises that airport expansion and other developments on the estate may result in disturbance of environmental and cultural values. Potential impacts to these values will require consideration under the EPBC Act, AH Act and assessment under the Airports Act if the impact is deemed significant. The Federal Government will consider the baseline investigations conducted, impact assessment and management programs, prior to granting approvals in accordance with the Airports Act, AH Act and EPBC Act.

Perth Airport will continue to undertake studies and consider the environmental values of each precinct (described in Section 3), taking into account:

- aviation-related protection zones and restrictions,
- environmental values,
- Aboriginal heritage,
- drainage and flooding impact,
- potential contamination,
- environmental offset (either onsite or offsite) costs, and
- potential development costs.

This analysis will determine the suitability and capacity of land to be developed for either aviation or non-aviation uses. An assessment will be made to determine the viability of developing the land and, where development is proposed, the environmental impact will be assessed. Consistent with the Commonwealth's EPBC Act Environmental Offsets Policy (2012), Perth Airport will consider avoidance, minimisation and mitigation measures prior to considering offset measures. Projects with a high risk to environmental values are required to have a Construction Environment and Heritage Management Plan which is approved by Perth Airport and is in line with relevant approvals (if any) prior to construction commencing. Likewise, high risk tenants are required to develop, implement and maintain an Environmental Management Plan (EMP) to mitigate their risks.

Each of the measures combine to minimise environmental impacts of airport development and operations. Furthermore, to minimise ecological footprint, Perth Airport will focus on better waste management, reducing carbon footprint, energy and water efficiency.

9.5 Environmental Aspects

Perth Airport has determined the following environmental aspects as being potentially impacted by airport development and operations:

- soil,
- groundwater and surface water,
- biodiversity, including flora, fauna and wetlands,
- carbon and energy,
- water,
- waste,
- air quality,
- ground-based noise,
- contamination and hazardous materials, and
- Aboriginal heritage and engagement.

Each aspect is addressed in this Strategy, detailing:

- key objective/s to be achieved during the five-year strategy period,
- overview and relevant current environmental context at Perth Airport,
- activities and circumstances arising from development and operations at Perth Airport that have the potential to impact the environmental aspect,
- description of the existing environmental management approach,
- specific achievements related to the Environment Strategy 2014-2019, as well as independent environmental initiatives and achievements since 2015, and
- the program of actions that will be implemented in the next five years, as part of the current management framework to achieve the overarching objective/s.

General environmental management initiatives to be undertaken by Perth Airport between 2020 and 2024 are:

Initiative	
1	Certify the Environmental Management System to ISO 14001
2	Engage with tenants and airport operators to promote and improve sustainability performance across the estate
3	Develop and publish an annual report on sustainability performance
4	Develop and publish a sustainable procurement policy to guide Perth Airport purchasing and contracting
5	Review and update the Precinct Development Guidelines to incorporate: <ul style="list-style-type: none"> • water, waste, carbon and energy objectives, • biodiversity and land management guidance, and • environmental, social and governance.

A summary of the five-year Environment Strategy Implementation Plan is provided in Section 9.16, with details provided in the following sections.

9.6 Soil Management

9.6.1 Objectives

- Prevent contamination of soil within the Perth Airport estate.
- Manage and investigate known or potentially contaminated sites in accordance with relevant legislation.

9.6.2 Overview

The Perth Airport estate is located on the Bassendean Dunes and Guildford Formations of the Swan Coastal Plain. The sand of the Bassendean Dunes on the airport estate has an average depth of four metres and is underlain by clayey sand, silty sand,

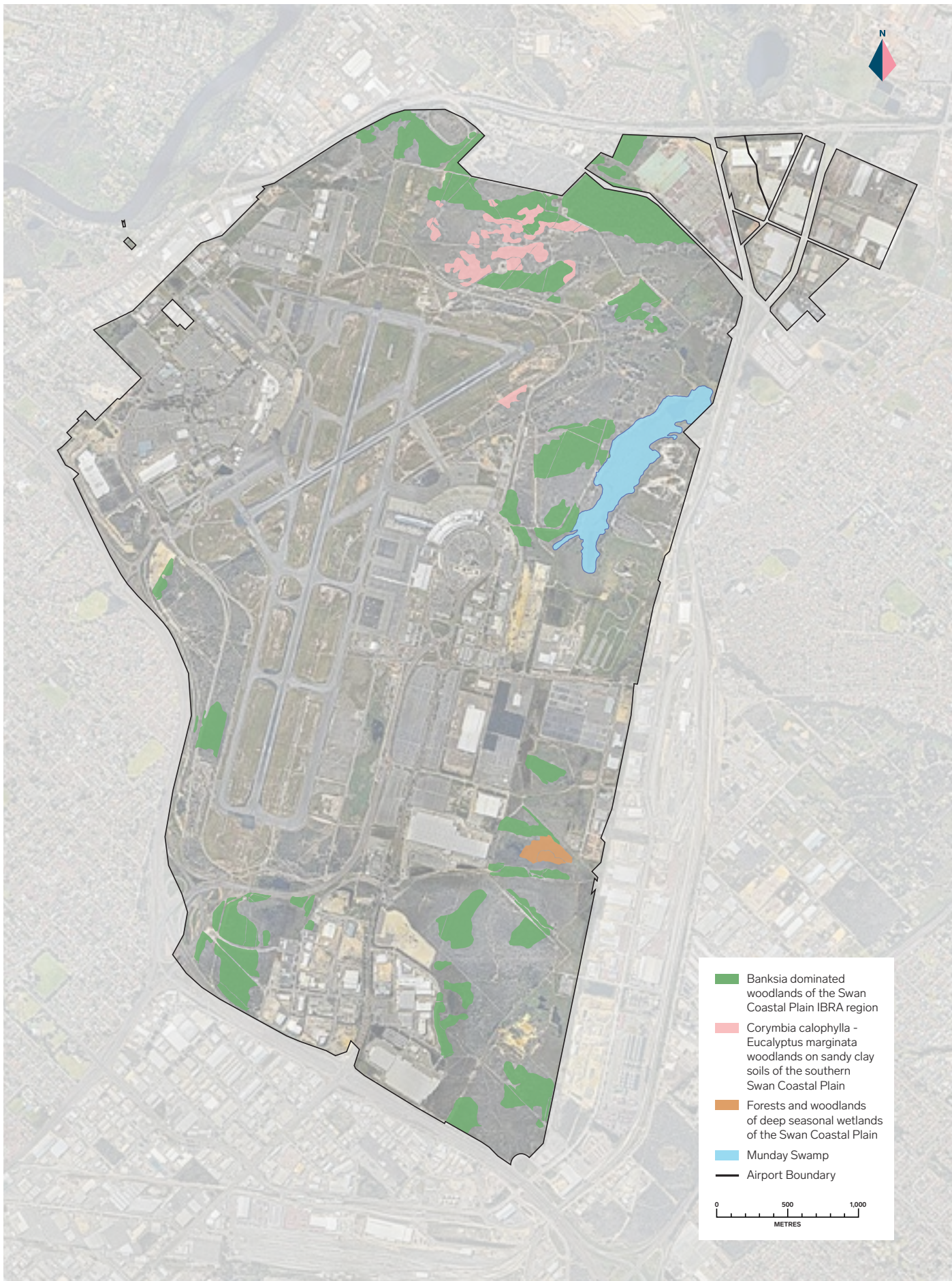


Figure 9-3 Environmentally Significant Areas
Source: Perth Airport

sand and clays of the Guildford Formation. The nature of the landform and geology of the estate has the potential to impact the immediate and surrounding environment if appropriate management is not in place. Any surface contamination event has the potential to permeate into the overlying sand and potentially impact groundwater.

The majority of the soil within the estate is free from contamination. Contamination has been identified as a result of landfill, aviation, fuel storage and industrial activities, as well as natural causes such as the fungus *Phytophthora cinnamomi* (dieback). A number of these sites require active management to ensure impacts are minimised.

As commonly encountered in the Swan Coastal Plain, potential acid sulfate soils are known to be present on the estate.

Construction activities that have the potential to disturb acid sulfate soils material include:

- excavations to groundwater depth,
- disturbance of peaty materials, and
- removal of groundwater (dewatering).

Subsequently, the management of soils on the estate requires consideration of several aspects including; soil type, soil quality, surface water and groundwater.

9.6.3 Current Management

As part of the design and approval process for projects, Perth Airport undertakes a preliminary assessment to determine the potential for environmental impact from construction and operation activities. If additional investigations are required to determine soil quality (for example, contamination assessment or acid sulfate soil investigations), these are required to be undertaken prior to works commencing. Based on this information, soil management measures are determined and management plans developed to reduce the risk of degradation to soil values on the estate.

9.6.3.1 Acid Sulfate Soils

Acid sulfate soils are naturally occurring soils, sediments and peats that contain iron sulphides. In an anaerobic state, these materials remain benign and do not pose a significant risk to human health or the environment. However, disturbing acid sulfate soils and exposing them to oxygen has the potential to cause the release of acidity and dissolution of metals into groundwater.

The risk of contamination is considered minimal until activities are proposed that disturb acid sulfate soil materials. Prior to any ground disturbing works being undertaken, Perth Airport uses the acid sulfate soil risk map on its Geographic Information System (GIS), produced in association with Bulletin 64 by the Western Australian Planning Commission (WAPC), as a tool to assess whether acid sulfate soil is a risk in any proposed work area. The mapping indicates that the airport estate predominately poses a moderate to low risk of acid sulfate soils occurring in the soils beneath the estate, however small areas of high to moderate risk are located in low-lying wetlands and dune swales. Where the risk of acid sulfate soil disturbance is likely, an acid sulfate soil investigation will be conducted prior to works commencing and, where applicable, an Acid Sulfate Soil Management Plan developed and implemented.

9.6.3.2 Contaminated Sites

Measures are put in place to prevent contamination of soil. Measures can include the implementation of Standard Work Procedures, construction or operational EMP, and the control of fill material being relocated and imported onto the estate

through appropriate guidelines and approvals. Detailed information on specific sites, management responses and progress are provided in Perth Airport's Annual Environment Report submitted to Department of Infrastructure, Transport, Regional Development and Communications. To ensure compliance with the AEP Regulations, Perth Airport:

- maintains an Environmental Site Register, detailing all known areas of contamination on the estate,
- collaborates with the AEO and tenants in the investigation, management and remediation of known contaminated sites, and
- monitors and reports annually on all known sites of soil contamination.

Site environmental management is also addressed in sub-leases between Perth Airport and its tenants. Site operations must be undertaken in accordance with sub-lease agreements, the Airports Act, AEP Regulations and this Environment Strategy.

The management of per- and poly-fluoro alkyl substances (PFAS) is detailed in Section 9.14.

9.6.4 Potential Impacts – Development

Construction activities that may create disturbance to soil or soil impacts include:

- clearing of vegetation,
- earthmoving and excavations, and
- the importation and relocation of fill material.

These construction activities also have the potential to:

- impact known or unknown contaminated sites,
- disturb acid sulfate soils, and/or
- introduce dieback (*Phytophthora cinnamomi*) to previously unaffected areas.

9.6.5 Potential Impacts – Operations

Operational activities on the estate, including those of non-aviation tenants, have the potential to impact soil and cause contamination through the use, storage and spillage of chemicals and fuels, or through inappropriate waste or contaminated soil disposal. Spillage and contamination risks include:

- underground storage tanks,
- refuelling and bulk fuel-handling stores,
- manufacturing, distribution and industrial activities conducted by tenants, and
- sewerage leaks and spills.

9.6.6 Recent Achievements

Over the period of the Environment Strategy 2015-2019, a range of soil management commitments were achieved, including:

- baseline contamination assessments were undertaken for all greenfield developments to inform appropriate site management,
- in 2015, a new procedure was documented and implemented for 'end of lease' site environmental evaluation. This process informs appropriate site remediation, if required, and any identified potential contamination is reported to the AEO,
- testing and mapping of the soil fungus *Phytophthora cinnamomi* (dieback) across the airport estate was conducted in 2017 to inform dieback management and priority areas for the annual treatment program,
- the Perth Airport Fill Material Management Guidelines were updated in 2017 to include consideration of dieback, and
- continued collaboration with tenants on management and remediation actions for identified contaminated sites, with remedial works resulting in a reduction in identified contamination levels at some sites.

9.6.7 Five-Year Action Program

Initiatives to be undertaken between 2020 and 2024 as part of Perth Airport's five-year action program for soil management are as follows. It should be noted that this initiative is in addition to the regular business as usual monitoring outlined previously in Table 9-1.

Initiative

1	Undertake further dieback assessment
---	--------------------------------------

9.7 Groundwater and Surface Water Management

9.7.1 Objectives

- Manage operational and development activities such that groundwater levels are maintained and groundwater quality on the estate is protected.
- Maintain, protect and improve the environmental value of surface water and surface water features across the estate.

9.7.2 Overview

The estate is located on the Swan Coastal Plain. It is relatively flat and is near the base of the Darling Scarp, extending to within 500 metres of the Swan River. Groundwater beneath the estate sits at a shallow depth (surface to four metres below ground level) as an unconfined water table within the highly permeable sands of the Bassendean Dunes and as a semi-confined aquifer in the Guildford Formation.

Groundwater flows in a north-westerly direction across the estate. Surface water features are interspersed across the estate in the form of wetlands (seasonal, permanent and constructed), the Southern Main Drain (SMD) and the Northern Main Drain (NMD) (described in Section 8). The main drains generally flow in an east to west direction, discharging into the Swan River, and have been constructed as extensions and modifications to naturally occurring water bodies.

The surface water features on the estate relate directly to, or interface with, the shallow groundwater. The main drains and the wider arterial drain network intersect the groundwater table at various locations, partially draining the site, limiting maximum groundwater levels. This provides surface flow in the main drains throughout most of the year.

Wetlands present on the estate are also partially or wholly a surface expression of the groundwater table. Constructed wetlands are discussed in this section and naturally occurring wetlands of identified environmental value are discussed in Section 9.8. Historically, the presence of the SMD and NMD, and the topographical and geological features of the estate have acted to moderate the local catchment, retaining water on site during times of high rainfall and flood. This results in a positive impact on water quality as it flows from east to west through the estate, before discharging into the Swan River.

Catchment conditions impact the quality of water entering the estate. Typically, water entering the estate has elevated levels of nutrients and metals, and broadly reflects regional water quality. This is a consequence of current and past upstream land uses and management practices in adjacent areas. These upstream catchment conditions have a direct impact on the quality of groundwater and surface water conditions encountered at the estate.

9.7.2.1 Groundwater

Historic land uses, the quality of surrounding catchments which flow onto the estate and naturally occurring conditions are reflected in long-term groundwater monitoring results. As a result, concentrations of nutrients and heavy metals regularly exceed the acceptance criteria detailed in the AEP Regulations. Nutrient concentrations tend to represent historic land uses such as agriculture, industrial and residential uses, while metal concentrations are indicative of the conditions on the Swan Coastal Plain.

There are isolated instances of groundwater contamination primarily associated with areas of soil contamination. Modelling and monitoring indicate the majority of contamination plumes are restricted to areas directly under or adjacent to the original source and represent limited risk to the environment on the basis of appropriate management. Monitoring indicates that superficial groundwater levels on the estate have not declined over the last 10 years, despite a continued decline in rainfall during this period. Superficial groundwater levels appear to be maintained by inter-aquifer relationships, whereby deeper aquifers are partially recharging the superficial aquifer.

9.7.2.2 Surface Water

Water quality within the drains, at the point where it first flows into the estate, frequently exceeds the acceptance criteria detailed in the AEP Regulations for a variety of chemical pollutants. In addition, developments outside the estate and within the upstream catchments have increased the rate of runoff, increasing the volume of water flowing through the estate. Historically, undeveloped land on the estate has been used as storage to compensate for these increased flows. The water quality entering the estate in the NMD and SMD reflects the land uses of the upstream catchment, which includes:

- the Forrestfield Rail marshalling yards,
- former and current agricultural and horticultural uses, and
- commercial, industrial and residential developments.

Much of the upstream catchment remains un-sewered, and the historic and ongoing use of septic tanks and other onsite wastewater treatment is a major contributor to the level of nutrients recorded. The SMD receives surface flow from Crumpet Creek, which flows through the Forrestfield Rail marshalling yards and a number of residential suburbs. The NMD receives surface flow from the overflow of Munday Swamp and Poison Gully. Munday Swamp is also fed by the High Wycombe Branch Drain and Macao Road Branch Drain. These drains convey water from the northern end of the Forrestfield Rail marshalling yards and residential areas in the City of Kalamunda.

Water flows from built infrastructure (such as roads, car parks, tarmac areas and roofing) within the airport estate are directed into the drainage system. This consists primarily of open drains and is formalised in developed areas through piping and associated water quality management mechanisms.

Extensive monitoring since 1998 has demonstrated that activities across the estate do not generally degrade the existing regional surface water quality. This may be attributed to the availability of land that has acted to detain water and interaction with the shallow groundwater aquifer, allowing natural processes to improve water quality. However, as the estate continues to be developed, less land will be available for this purpose.

9.7.3 Potential Impacts – Development

The potential for development activities to impact groundwater and surface water on the estate include:

- increased abstraction due to greater demand for groundwater resources with the commencement of development works on the estate, along with associated maintenance and upkeep of resulting developed areas (for example reticulation of grassed areas around new developments). Should groundwater levels change significantly, acid sulfate soil has the potential to be exposed to air, which may mobilise heavy metals and acid contaminants into the groundwater beneath the estate. Changes to groundwater levels may impact groundwater-reliant ecology,
- increased development will have an impact on groundwater infiltration, which may increase groundwater levels on the estate. Drainage management changes have the potential to alter infiltration patterns and groundwater mobilisation. Removal of vegetation may impact infiltration levels through the reduction in transpiration, and
- construction and operation of developments may adversely impact water quality through contamination or mobilisation of suspended solids.

9.7.4 Potential Impacts – Offsite Water Migration

Long-term monitoring has shown that nutrient levels in ground and surface water from upstream sources entering the estate are higher than levels in water exiting the estate. Currently, undeveloped land on the estate may improve water quality, along with drainage projects such as the Living Stream. As the availability of undeveloped land decreases and interaction with the groundwater table increases, the potential exists for higher nutrient loads in ground and surface water to migrate offsite and impact the Swan River.

9.7.5 Potential Impacts – Operations

Activities within the estate, including the operations of tenants, have the potential to impact groundwater and surface water. This risk will increase as the airport estate continues to be developed. Potential sources of impact are:

- unsustainable use of groundwater,
- substance spills (including fuels, oils and other hazardous substances),
- infiltration of materials (used in airport operations) through the soil and into groundwater. This could also include materials being washed into drains and onto unsealed soil and grassed areas, as well as leachable materials being stored on unsealed areas,
- discharge of hazardous materials and fuels,
- increased operations and number of tenants on the estate, leading to increased risk and frequency of spills, and
- poorly maintained drainage management infrastructure, such as interceptor pits and gross pollutant traps.

9.7.6 Current Management

Perth Airport currently manages ground and surface water through a range of integrated approaches detailed below.

9.7.6.1 Monitoring

Monitoring is undertaken and reported in accordance with the AEP Regulations. Perth Airport has implemented a comprehensive water monitoring program since 1998, which provides data on surface and groundwater levels and water quality. Figure 9-4 identifies the groundwater and surface monitoring sites. Monitoring is typically undertaken quarterly.

Water quality monitoring results are compared to the acceptance criteria outlined in Schedule 2 of the AEP Regulations. Results are also compared to the National Environment Protection Measures (NEPM Contaminated Sites, 2013) and the Swan Canning Water Quality Improvement Plan to determine water quality and the extent of any potential contamination.

9.7.6.2 Project Assessment and Environmental Management Plans

Perth Airport's project assessment and management plans for construction and ongoing operations reduce the risk of degradation to water values on the estate. Examples of these include:

- project delivery system – all projects are assessed through an environmental screening checklist to determine the potential for environmental impact,
- construction EMP – development activities with moderate to high risk of adverse impacts to environmental and/or heritage values are required to be supported by an EMP. Perth Airport reviews each EMP prior to works being permitted to commence, and
- operational EMP - tenants and contractors are required to develop an EMP to demonstrate how environmental risks and potential impacts will be managed during ongoing operational phases.

The Construction and Operational EMPs must contain a risk assessment identifying risks and management measures, including pollution control systems and monitoring programs. The EMPs are reviewed by qualified Perth Airport employees and external auditing is undertaken to monitor compliance.

9.7.6.3 Perth Airport Estate and Catchment Management

Perth Airport has developed a Master Drainage Strategy which:

- identifies the surface water management requirements up to and including the full development scenario of the estate,
- considers water volumes likely to be received from upstream catchments, noting Perth Airport will provide detention storage based on the legacy 1997 peak flow levels entering the airport estate from upstream,
- informs Perth Airport's decision making regarding flood management and water conveyance on the estate, as well as limiting water discharged from the estate to legacy 1997 peak flow rates, and
- facilitates land use planning and design decisions for drainage infrastructure on the estate.

Perth Airport has implemented the principles of a 'living stream' approach, focusing on water quality and water storage capacity improvements to the SMD. The project recognises the potential for improving the water quality of the SMD and ensuring the development and operations of the estate do not negatively impact the water quality. The living stream project commenced construction in 2014, with recent works completed in 2018. Additional works will be undertaken with future development activities.

Perth Airport continues to engage with State and Local Governments on catchment management matters. When atypical water quality results are detected on the estate boundary, relevant catchment authorities are notified and, where appropriate, action plans are developed.

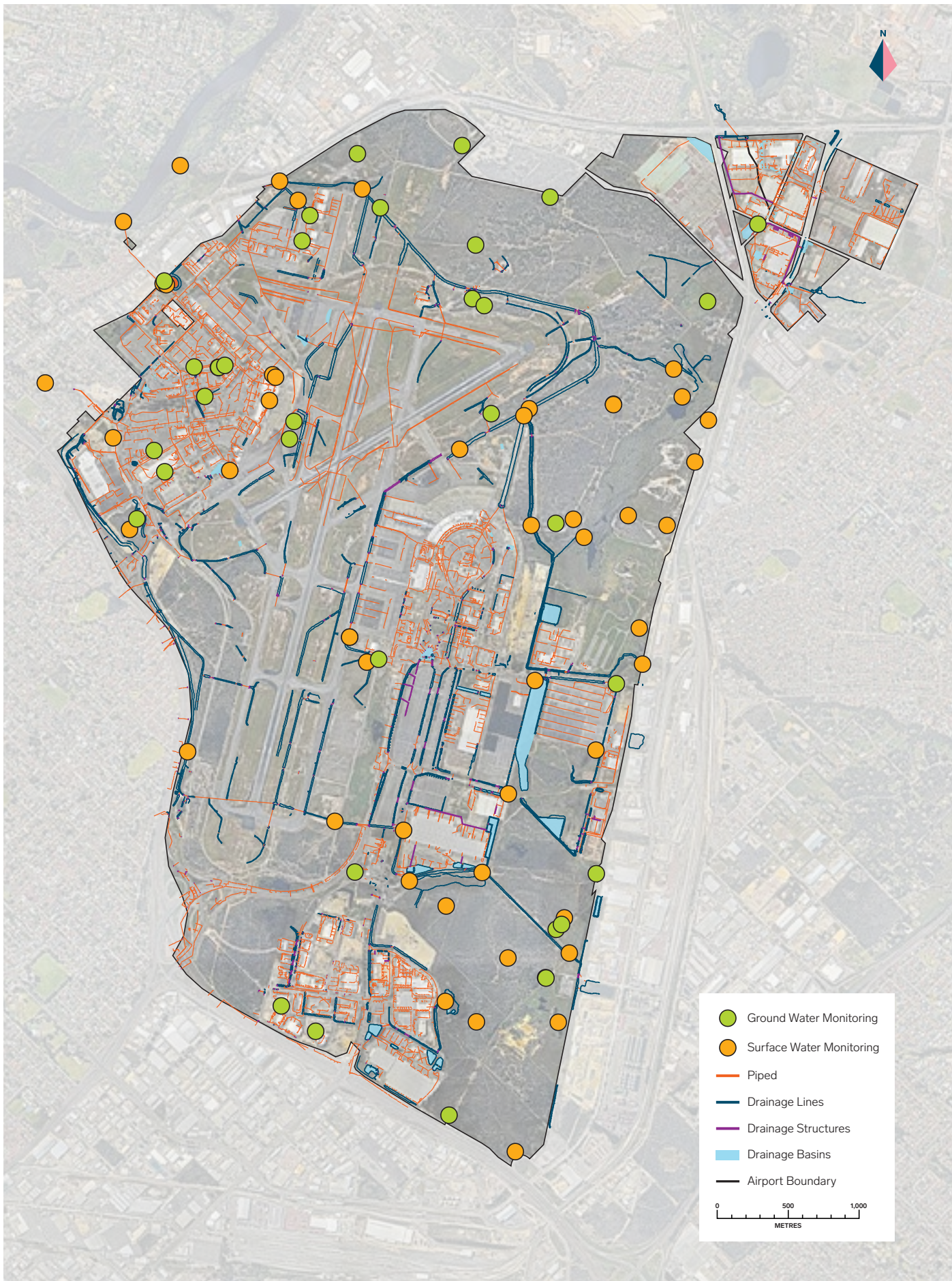


Figure 9-4 Groundwater and surface water monitoring sites
Source: Perth Airport

9.7.7 Recent Achievements

Over the period of the Environment Strategy 2015–2019, a range of groundwater and surface water management commitments were achieved including:

- since December 2015, AEP Regulations and Western Australian Department of Water and Environment Regulation (DWER) criteria have been adopted and incorporated into water quality site assessment evaluations and a new environmental monitoring database,
- between 2015 and 2018, three key projects were undertaken on the SMD to provide upgraded capacity and additional storage detention basins to cater for one-in-100 year storm events,
- extensive groundwater and surface water monitoring and assessment was undertaken throughout the entire period,
- the Perth Airport Master Drainage Strategy was reviewed in 2017 to identify modifications required to the NMD and SMD to enable the planned and future development of the estate,
- aquatic macro-invertebrate fauna sampling undertaken in Munday Swamp, Kwenda Malark Wetland and the airport's stormwater drainage infrastructure in 2017,
- a formal airside drainage interceptor pit management regime, that defines the inspection and maintenance programme, commenced in 2017,
- a Catchment Management Group was established in 2018, comprising representatives from the City of Kalamunda, City of Belmont, Water Corporation, Department of Biodiversity Conservation and Attractions, Department of Water and Environment Regulation and Perth Airport, to discuss catchment planning and management, and
- ongoing quarterly water quality management activities, which are revised annually and ensure effective evaluation and management across the estate.

9.7.8 Five-Year Action Program

Initiatives to be undertaken between 2020 and 2024 as part of Perth Airport's five-year action program for ground and surface water management are detailed below and are in addition to the business as usual ongoing approval and operational management of ground and surface water, such as review and approvals of construction environmental management plans prior to commencement of works and tenant audits for example.

Initiatives

- | | |
|---|---|
| 1 | Develop and implement a Groundwater Extraction Management Plan (including surface water where appropriate) for monitoring and management of Perth Airport and tenant groundwater extraction |
| 2 | Undertake monitoring of macroinvertebrates in natural water bodies to coincide with international terminal upgrades, new terminal and/or New Runway Project |
| 3 | Incorporate water sensitive urban design principles in Design Guidelines for on estate developments |

9.8 Biodiversity Management

9.8.1 Objective

- Maintain and protect environmental values onsite or, where agreed with regulatory authorities, provide offsite offsets for listed environmental values as appropriate.

9.8.2 Overview

The Perth Airport estate is situated on the Swan Coastal Plain at the base of the Darling Scarp, within the Drummond Botanical Subdistrict. The natural environment of the estate has been significantly disturbed by historic uses, however there are areas of vegetation that remain intact, albeit in variable condition as shown in Figure 9-5.

Flora surveys have been periodically undertaken across the estate since 1983. Vegetation associations present on the estate include the Southern River Complex, Guildford Complex and Bassendean Complex, as shown in Figure 9-6. The Southern River Complex is the dominant vegetation complex represented on the estate, comprising open woodlands of Marri-Jarrah-Banksia species in elevated areas, and fringing woodlands of Flooded Gum and Swamp Paperbark.

Surveys have indicated the presence of over 450 vascular plant taxa from 267 plant genera and 73 families. Two flora species, *Conospermum undulatum* and *Macarthuria keigheryi* are listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) as vulnerable and endangered respectively. These species are also listed as Threatened Flora under the *Biodiversity Conservation Act 2016* (WA) (BC Act).

Nine of the flora species are Priority listed flora species by the State Department of Biodiversity, Conservation and Attractions (DBCA). Priority flora lists are maintained by the DBCA to identify flora species which are considered to be potentially under threat or poorly understood and do meet criteria to be listed as Threatened Flora. Threatened Flora species on the estate are shown in Figure 9-7.

A total of fourteen vegetation community types have been mapped on the estate. Figure 9-8 shows the vegetation community types present on the estate and Table 9-2 shows the description of each vegetation community types.

Threatened ecological communities listed by the Commonwealth and the State are mapped by the DBCA as being present on the estate, however verification of the data used for mapping is required in order to definitively determine the presence of vegetation communities. Figure 9-9, shows the actual threatened ecological communities mapped on the estate as determined during a 2018 spring survey.

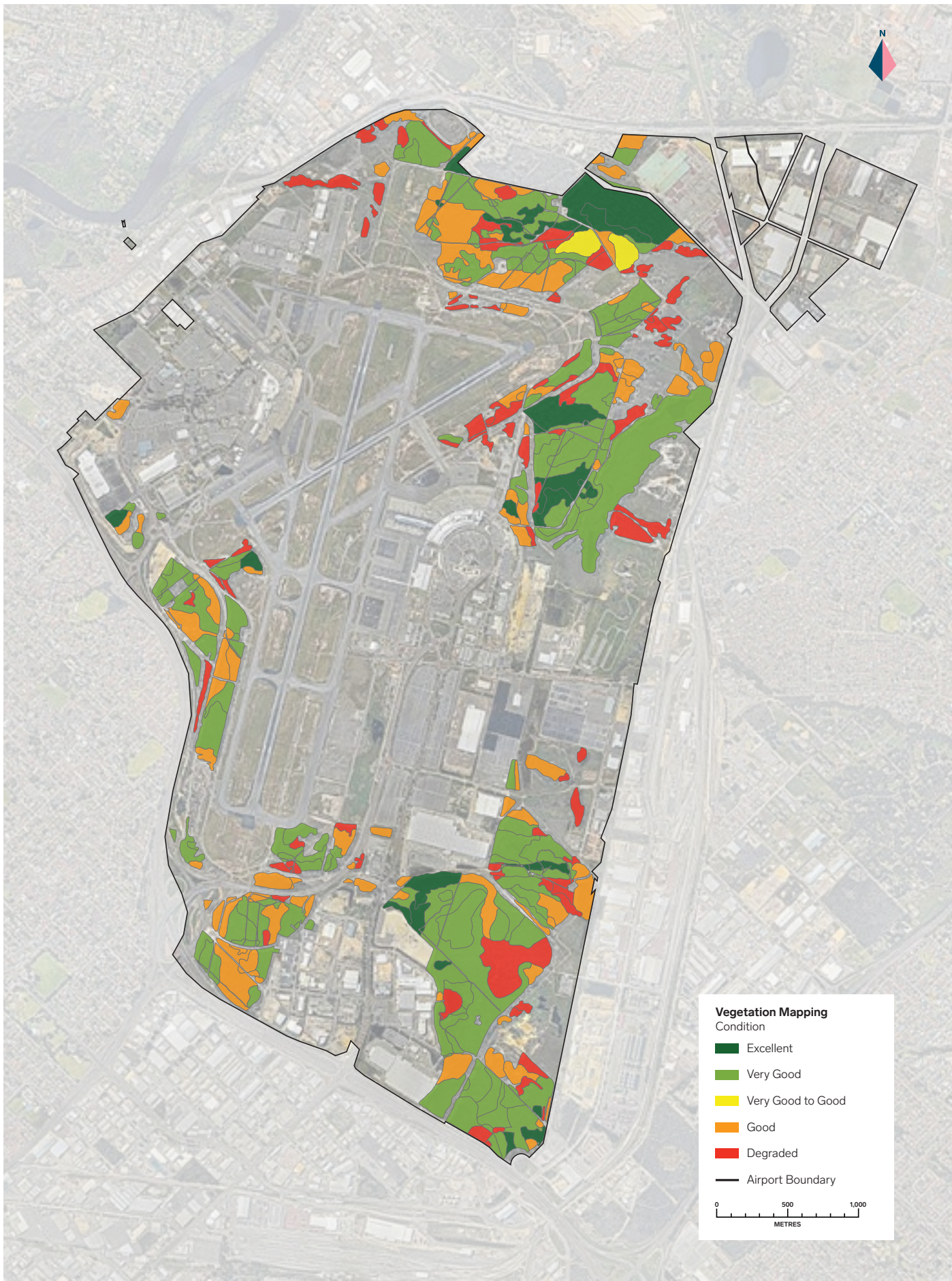


Figure 9-5 Vegetation Condition
Source: Woodman Environmental 2019

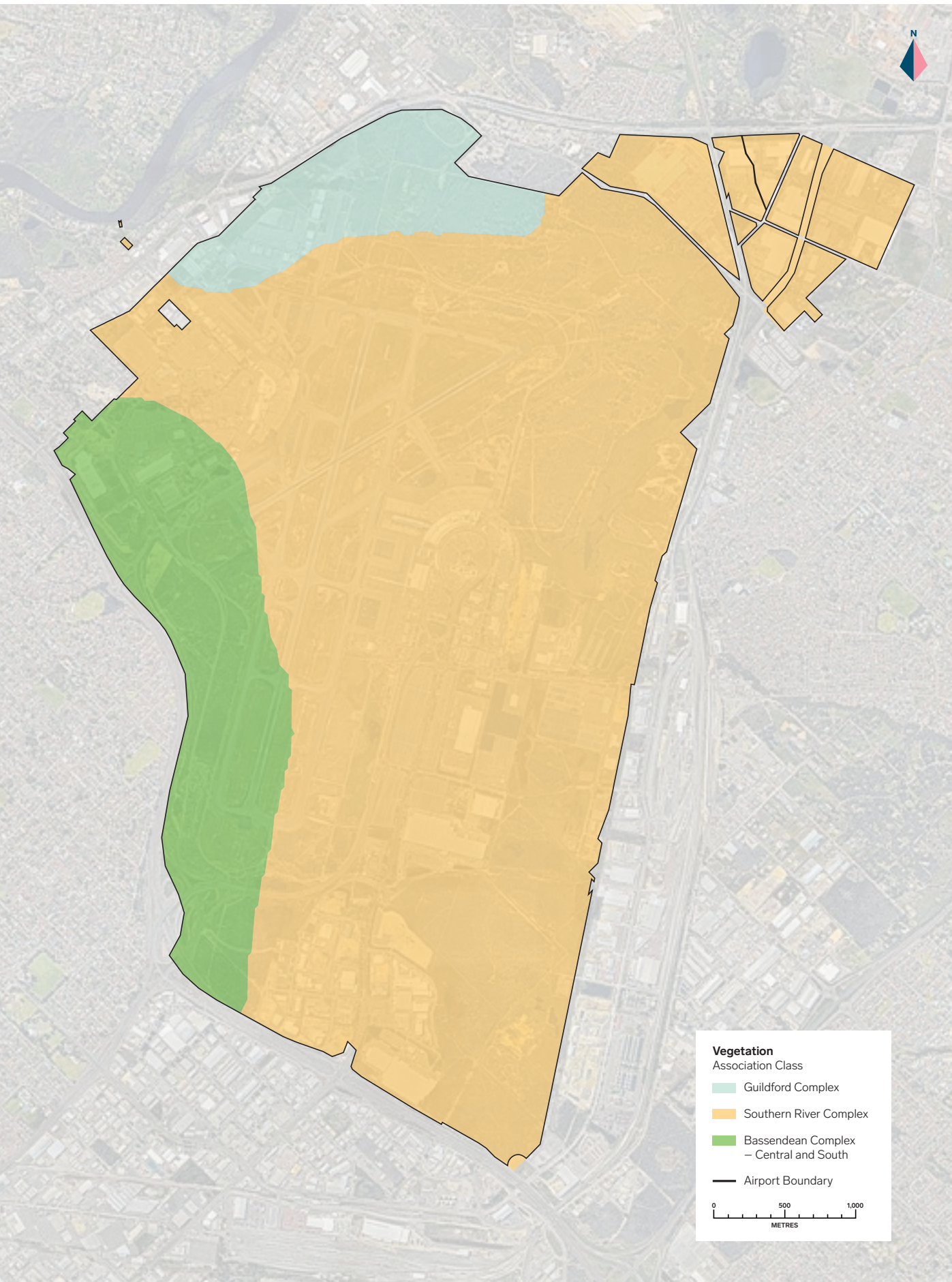


Figure 9-6 Vegetation Association Class
Source: Department of Biodiversity, Conservation and Attractions



Figure 9-7 Threatened Flora within the Perth Airport estate
 Source: Woodman Environmental 2019

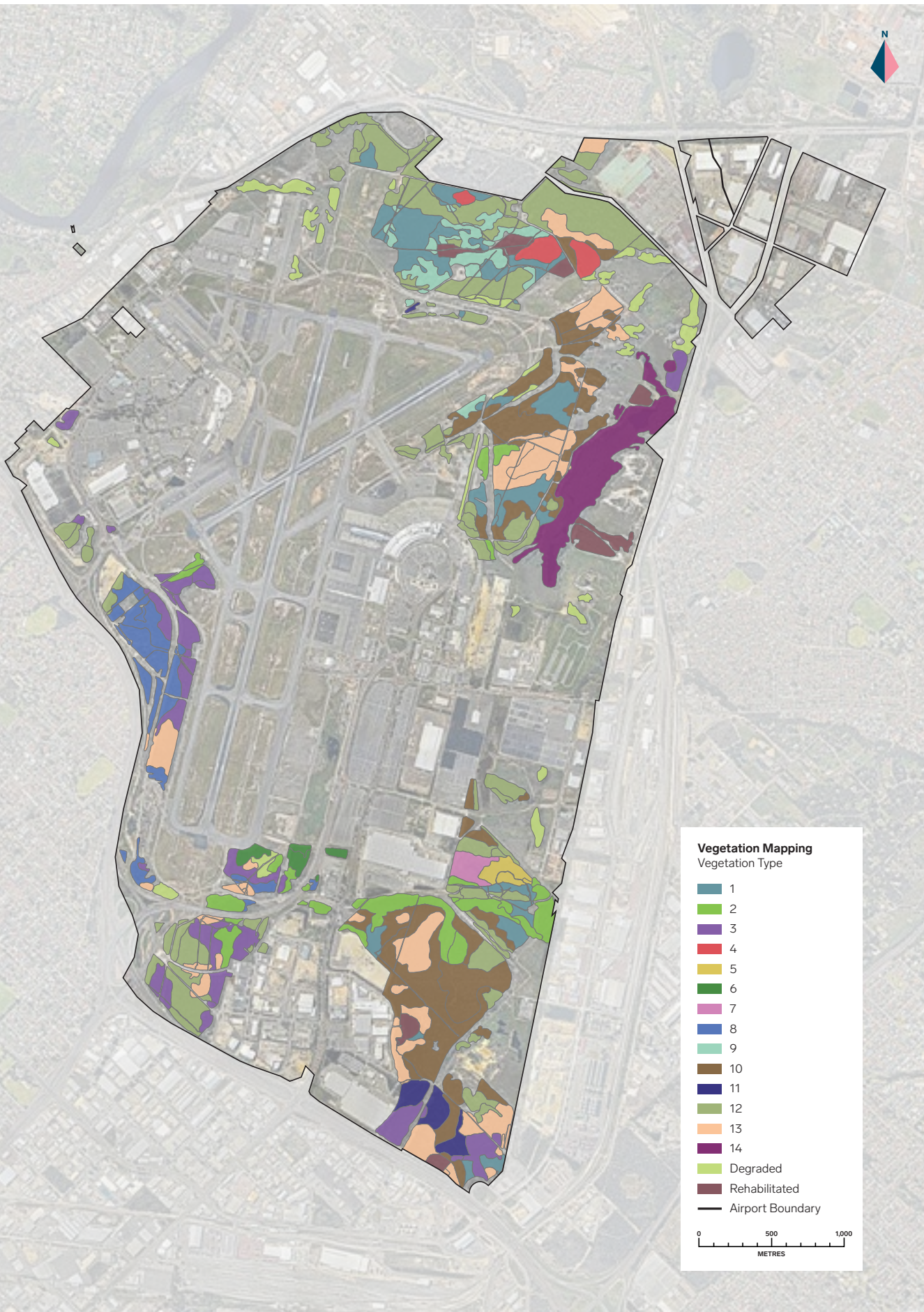


Figure 9-8 Vegetation Community Types
Source: Woodman Environmental 2019

VT	Description
1	Low isolated trees of <i>Melaleuca preissiana</i> over mid to low shrubland of mixed species dominated by <i>Hakea varia</i> , <i>Melaleuca seriata</i> , <i>Pericalymma ellipticum</i> var. <i>floridum</i> , <i>Verticordia densiflora</i> var. <i>densiflora</i> and <i>Astartea affinis</i> over low open rushland dominated by <i>Leptocarpus decipiens</i> , <i>Lyginia imberbis</i> , <i>Hypolaena exsulca</i> and <i>Cytogonidium leptocarpoides</i> over low sparse forbland of mixed species including <i>Aphelia cyperoides</i> , <i>Centrolepis aristata</i> , <i>Hyalosperma cotula</i> , <i>Tribonanthes australis</i> and <i>Siloxerus humifusus</i> in depressions or on flats that are seasonally waterlogged, on grey-brown or grey-black sandy loam.
2	Low woodland to forest dominated by <i>Melaleuca raphiophylla</i> over tall to mid open to sparse shrubland of mixed species including <i>Astartea affinis</i> , <i>Melaleuca lateritia</i> , <i>Hakea varia</i> and <i>Pericalymma ellipticum</i> var. <i>floridum</i> over low rushland and sedgeland to open rushland and sedgeland dominated by <i>Leptocarpus decipiens</i> and occasionally <i>Lepidosperma longitudinale</i> over low sparse forbland of mixed species including <i>Centrolepis aristata</i> , <i>Isolepis stellata</i> , <i>Juncus capitatus</i> , <i>Siloxerus filifolius</i> and <i>Isolepis cyperoides</i> on flats or in basins that are seasonally inundated, on grey or brown sand or sandy loams.
3	Low woodland to open woodland dominated by <i>Melaleuca preissiana</i> over mid open shrubland of mixed species including <i>Astartea affinis</i> , <i>Hypocalymma angustifolium</i> subsp. Swan Coastal Plain (G.J. Keighery 16777) and <i>Pericalymma ellipticum</i> var. <i>floridum</i> over low sedgeland and rushland to open sedgeland and rushland of mixed species dominated by most often dominated by <i>Lepidosperma longitudinale</i> , <i>Schoenus efoliatus</i> and occasionally <i>Dielsia stenostachya</i> in depressions or drainage lines that are seasonally inundated, on grey or brown sandy loams.
4	Tall sparse shrubland of <i>Melaleuca raphiophylla</i> over mid shrubland of <i>Melaleuca lateritia</i> over low forbland and tussock grassland of mixed species dominated by <i>Lachnagrostis filiformis</i> , * <i>Lotus subbiflorus</i> , <i>Liparophyllum capitatum</i> , * <i>Vulpia myuros</i> forma <i>megalura</i> and <i>Isolepis marginata</i> in basins that are seasonally inundated, on grey-black sandy clay.
5	Tall closed shrubland of <i>Melaleuca viminea</i> subsp. <i>viminea</i> over low sparse rushland of <i>Leptocarpus decipiens</i> over low open forbland of mixed species dominated by <i>Isolepis cernua</i> var. <i>setiformis</i> in deep depressions that are seasonally inundated, on grey brown sandy clay.
6	Tall closed shrubland dominated by <i>Melaleuca raphiophylla</i> and occasionally <i>Melaleuca teretifolia</i> and <i>Melaleuca viminea</i> subsp. <i>viminea</i> over mid sedgeland and rushland of mixed species including <i>Leptocarpus coangustus</i> , <i>Baumea articulata</i> , <i>Lepidosperma longitudinale</i> , <i>Schoenus subfascicularis</i> and <i>Leptocarpus decipiens</i> over low sparse forbland of mixed species including <i>Cynogeton lineare</i> and <i>Isolepis cernua</i> var. <i>setiformis</i> in basins that are seasonally inundated, on brown sandy loam.
7	Low woodland dominated by <i>Melaleuca raphiophylla</i> and occasionally <i>Melaleuca viminea</i> subsp. <i>viminea</i> over low sedgeland and rushland dominated by <i>Baumea juncea</i> and <i>Leptocarpus coangustus</i> on lake edges that appear semi-permanently inundated, on grey sandy loam.
8	Mid to low woodland to open woodland of <i>Corymbia calophylla</i> , <i>Eucalyptus marginata</i> and <i>Melaleuca preissiana</i> over mid to low open shrubland of mixed species dominated by <i>Xanthorrhoea brunonis</i> subsp. <i>brunonis</i> , <i>Gompholobium tomentosum</i> and <i>Calytrix fraseri</i> over low sedgeland and rushland dominated by <i>Phlebocarya ciliata</i> , <i>Alexgeorgea nitens</i> , <i>Dasyogon bromeliifolius</i> , <i>Patersonia occidentalis</i> var. <i>occidentalis</i> and <i>Hypolaena exsulca</i> on seasonally moist flats on grey sand.
9	Mid forest of <i>Corymbia calophylla</i> over mid to low shrubland of mixed species dominated by <i>Xanthorrhoea brunonis</i> subsp. <i>brunonis</i> , <i>Babingtonia camphorosmae</i> , <i>Hibbertia hypericoides</i> subsp. <i>hypericoides</i> and <i>Bossiaea eriocarpa</i> over low sedgeland and forbland dominated by <i>Tetraria octandra</i> , <i>Opercularia vaginata</i> , <i>Mesomelaena tetragona</i> and <i>Desmocladius fasciculatus</i> on lower to mid slopes of broad rises on grey sandy loam.
10	Isolated mid trees of <i>Corymbia calophylla</i> over open low woodland of <i>Melaleuca preissiana</i> over mid to low open shrubland to shrubland of mixed species dominated by <i>Hypocalymma angustifolium</i> subsp. Swan Coastal Plain (G.J. Keighery 16777), <i>Jacksonia gracillima</i> , <i>Pericalymma ellipticum</i> var. <i>floridum</i> , <i>Melaleuca seriata</i> and <i>Daviesia physodes</i> over low rushland and sedgeland to open rushland and sedgeland of mixed species dominated by <i>Cytogonidium leptocarpoides</i> , <i>Dasyogon bromeliifolius</i> , <i>Patersonia occidentalis</i> var. <i>occidentalis</i> , <i>Phlebocarya ciliata</i> and <i>Schoenus efoliatus</i> on lower slopes of broad rises and flats that are seasonally waterlogged, on grey or white sand or sandy loam.
11	Mid to low shrubland of mixed species dominated by <i>Hypocalymma angustifolium</i> subsp. Swan Coastal Plain (G.J. Keighery 16777), <i>Pericalymma ellipticum</i> var. <i>floridum</i> , <i>Melaleuca seriata</i> , <i>Euchilopsis linearis</i> and <i>Lechenaultia floribunda</i> over low open rushland and sedgeland dominated by <i>Cytogonidium leptocarpoides</i> , <i>Lyginia imberbis</i> , <i>Hypolaena exsulca</i> , <i>Dasyogon bromeliifolius</i> and <i>Phlebocarya ciliata</i> on lower slopes of broad rises and flats that are seasonally waterlogged, on brown sand.
12	Mid woodland of <i>Eucalyptus marginata</i> subsp. <i>marginata</i> over low woodland of <i>Allocasuarina fraseriana</i> , <i>Banksia menziesii</i> and <i>Banksia attenuata</i> over mid open to sparse shrubland of mixed species dominated by <i>Jacksonia floribunda</i> and <i>Calytrix fraseri</i> over low open shrubland of mixed species dominated by <i>Hibbertia hypericoides</i> subsp. <i>hypericoides</i> , <i>Bossiaea eriocarpa</i> , <i>Eremaea pauciflora</i> var. <i>pauciflora</i> and <i>Stirlingia latifolia</i> over low open to sparse sedgeland and rushland of mixed species including <i>Alexgeorgea nitens</i> , <i>Desmocladius flexuosus</i> , <i>Mesomelaena pseudostygia</i> and <i>Lyginia imberbis</i> on dunes and low rises on grey sand.
13	Low woodland to open forest of <i>Banksia menziesii</i> , <i>B. attenuata</i> and occasionally <i>Eucalyptus todtiana</i> over tall sparse shrubland dominated by <i>Adenanthos cygnorum</i> subsp. <i>cygnorum</i> over mid open to sparse shrubland of mixed species dominated by <i>Jacksonia floribunda</i> and <i>Melaleuca seriata</i> over low open shrubland of mixed species dominated by <i>Eremaea pauciflora</i> var. <i>pauciflora</i> , <i>Hibbertia hypericoides</i> subsp. <i>hypericoides</i> , <i>Scholtzia involucreta</i> and <i>Bossiaea eriocarpa</i> over low open to sparse sedgeland and rushland of mixed species dominated by <i>Alexgeorgea nitens</i> , <i>Dasyogon bromeliifolius</i> , <i>Patersonia occidentalis</i> var. <i>occidentalis</i> , <i>Desmocladius flexuosus</i> and <i>Lyginia imberbis</i> on dunes and low rises on grey sand.
14	Low forest of <i>Melaleuca raphiophylla</i> and <i>Eucalyptus rudis</i> over low sparse forbland dominated by <i>Lemna disperma</i> in basins that are apparently semi-permanently or permanently inundated, on black sandy clay.

Table 9-2 Vegetation Type Description

Source: Woodman Environmental 2019

The estate supports a diverse assemblage of vertebrate and invertebrate fauna. Numerous fauna surveys have recorded a total of 139 species of vertebrate fauna comprising three fish, eight frogs, 23 reptiles, 95 birds and ten mammals (including five introduced species). Surveys of the estate invertebrate assemblage revealed the presence of 92 species, comprising 59 taxonomic families.

The fauna species identified as Commonwealth or State listed environmental value that occur on the airport estate are:

- Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*), Forrest Red-tailed Black Cockatoo (*Calyptorhynchus banksii*) are regular visitors to the estate and Baudin's Black Cockatoo (*Calyptorhynchus baudini*) are irregular visitors. Foraging habitat is widespread across the estate as indicated in Figure 9-10 and Figure 9-11,
- Southern Brown Bandicoot, or Quenda (*Isodon obesulus fusciventer*), is listed as Priority 4 in Western Australia. The Quenda is abundant across the estate,
- Water Rat (Rakali – *Hydromys chrysogaster*), is listed Priority 4 in Western Australia and is an occasional visitor to the estate as individuals disperse along drains from nearby wetlands, and
- Native Bee (*Hyaleus globuliferus*), is listed as Priority 3 in Western Australia. Suitable habitat for the species is present on the estate and therefore it is likely to occur.

Additionally, potential habitat for the Western Swamp Tortoise (*Pseudemydura umbrina*) was previously identified on the Estate within the State's species recovery plan. However, investigations have indicated that engineered modification of the habitat would be required to render the site suitable. The latest studies indicate that the Western Swamp Tortoise is considered locally extinct.

Wetlands present on the estate vary from ephemeral to perennial, natural to artificial, and groundwater fed to surface water fed. State Government mapping indicates that wetlands of variable quality are present over the majority of the estate. Munday Swamp, the largest of all the wetlands present on the estate (approximately 20 hectares), is listed on the Commonwealth Directory of Important Wetlands in Australia. This wetland provides a permanent water source and, as such, supports an array of invertebrate and vertebrate fauna.

Northern Wetlands to the west of Munday Swamp are classified as sumplands. These sumplands are seasonally inundated and are also listed on the Commonwealth Directory of Important Wetlands in Australia. Other wetlands of note on the estate include Runway Swamp and the Kwenda Marlark Wetland (man-made) to the south.

Figure 9-12 shows the wetlands mapped on the estate following vegetation mapping in 2018.



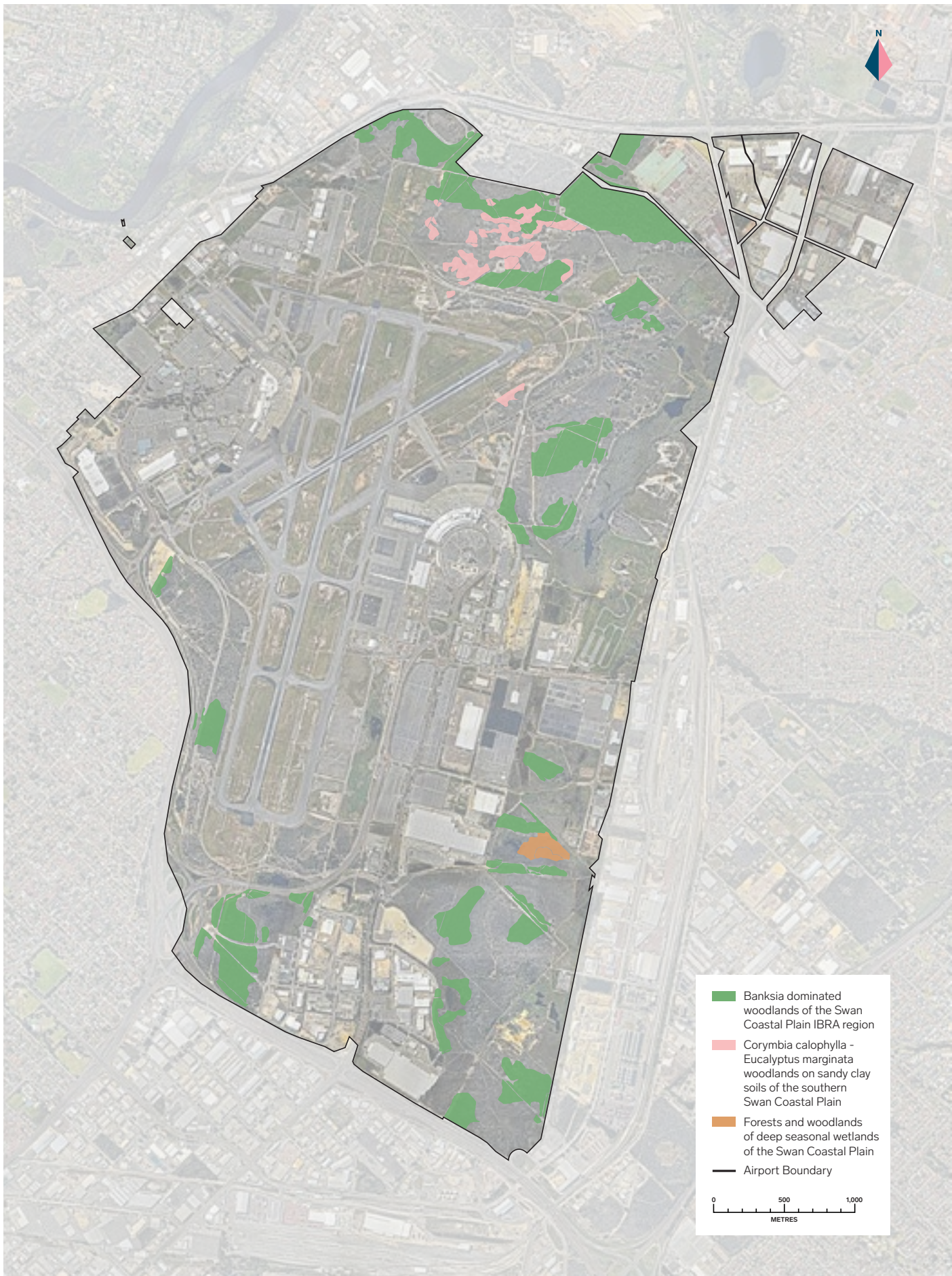


Figure 9-9 Threatened Ecological Communities
 Source: Woodman Environmental 2019

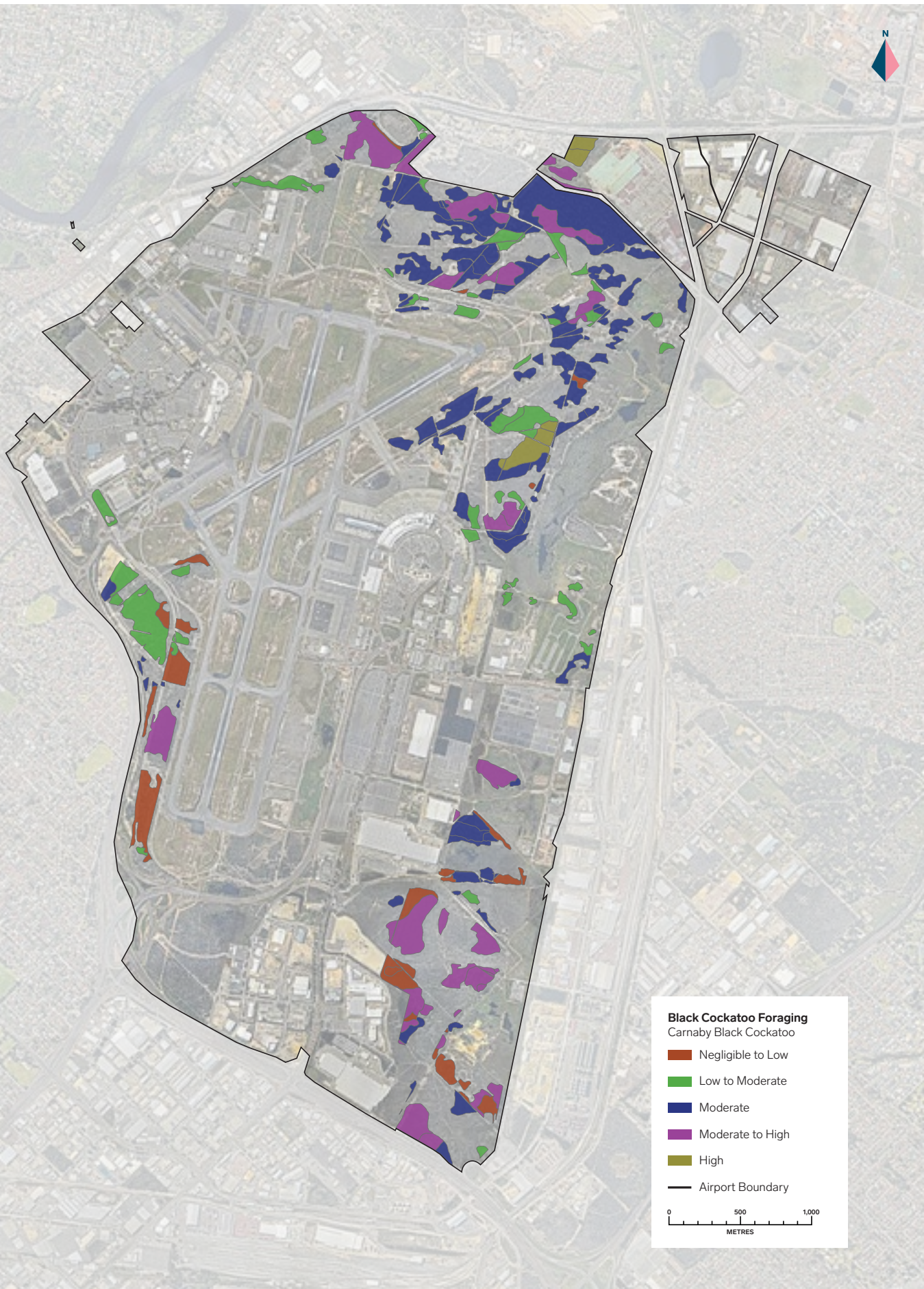


Figure 9-10 Black Cockatoo Foraging Habitat (Carnaby's)
Source: Bamford 2019

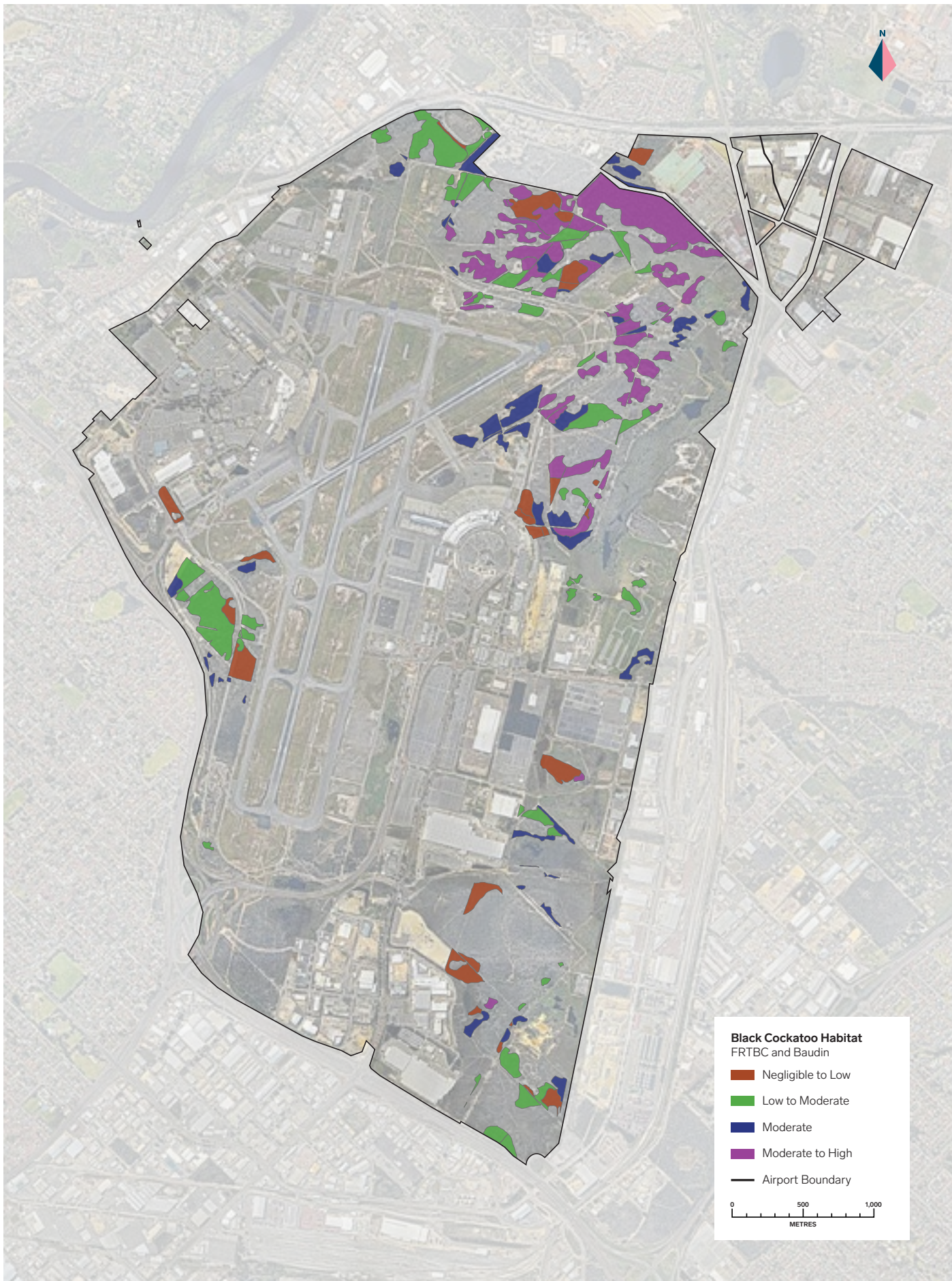


Figure 9-11 Black Cockatoo Foraging Habitat (Forrest Red-tail (FRTBC) and Baudins)
Source: Bamford 2019

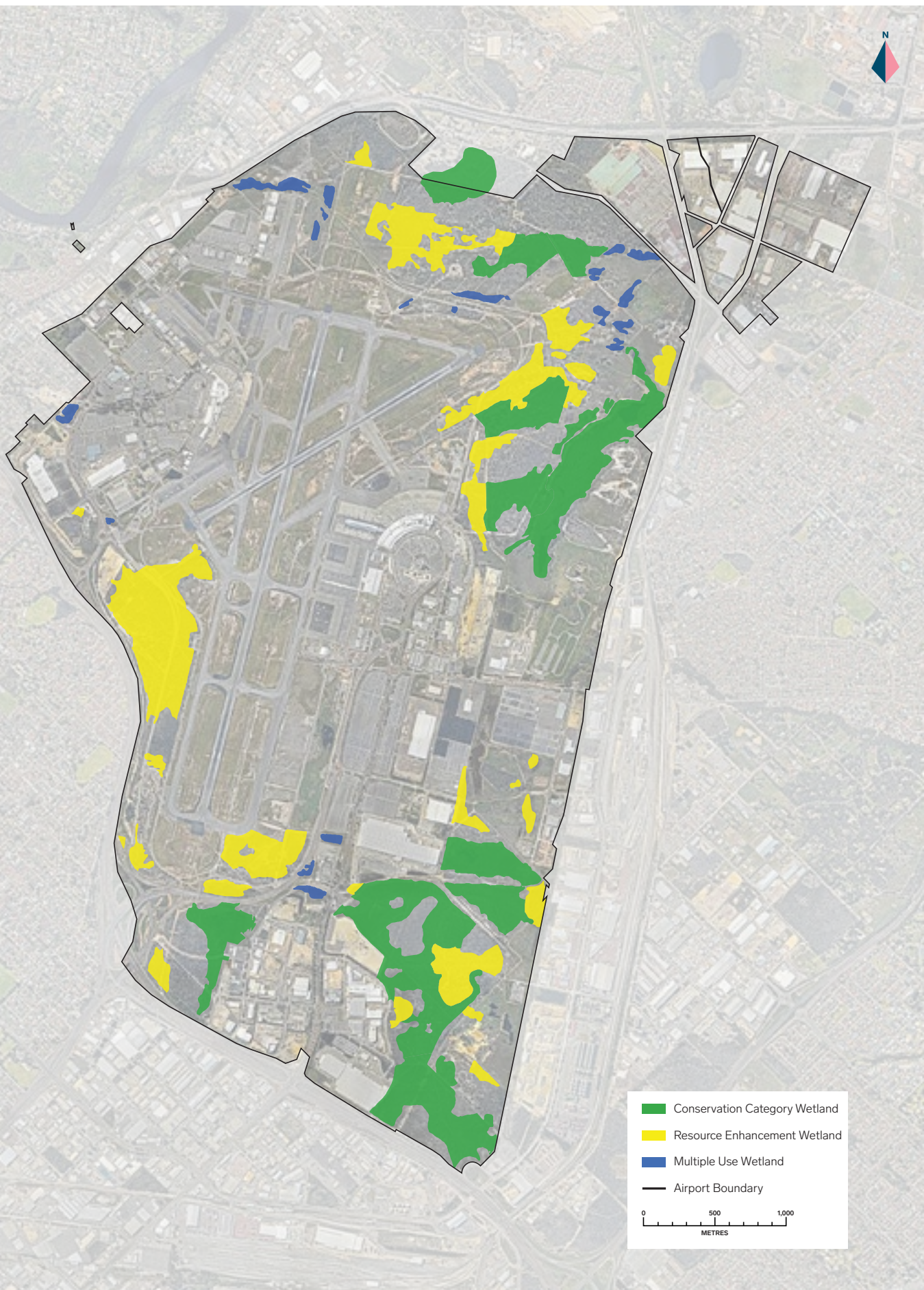


Figure 9-12 Wetlands within the Perth Airport estate
Source: Eco Logical Australia 2019

9.8.3 Environmental Values

The legislation and policies that define the environmental values on the airport estate include:

Commonwealth

- *Environment Protection and Biodiversity Conservation Act 1999*,
- *Airports Act 1996* and Airports (Environment Protection) Regulations 1997, and
- Directory of Important Wetlands in Australia.

State

- *Biodiversity Conservation Act 2016*, and
- Priority Species List.

Consultation with Commonwealth and State conservation bodies has been undertaken to confirm the boundaries of mapped values and methodologies for technical assessments. Further consultation on the methodology and outcomes will be undertaken with relevant conservation bodies.

The listed environmental values identified on the Perth Airport estate are summarised in Table 9-3.

Listed Environmental Value	Commonwealth Listing	State Listing	Perth Airport Precinct
Banksia attenuata and/or Eucalyptus marginata woodlands of the eastern side of the Swan Coastal Plain – SCP20b ¹	EPBC Act (endangered - Banksia Woodland)	Endangered	Absent
Banksia attenuata woodlands over species rich dense shrublands – SCP20a ¹	EPBC Act (endangered – Banksia Woodland)	Endangered	Absent
Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region – Various FTCs ^{1,2}	EPBC Act (endangered – Banksia Woodland)	Priority 3	Airport West, Airport North, Airport Central, Airport South, Airfield
Herb rich saline shrublands in clay pans – SCP07 ¹	EPBC Act (critically endangered)	Vulnerable	Absent
Eucalyptus calophylla – Eucalyptus marginata woodlands on sandy clay soils of the southern Swan Coastal Plain – SCP 3b ²		Vulnerable	Airport North
Forests and woodlands of deep seasonal wetlands of the Swan Coastal Plain – SCP 15 ²		Vulnerable	Airfield
Conospermum undulatum ^{1,2}	EPBC Act (vulnerable)	Threatened	Airport North, Airfield
Macarthuria keigheryi ^{1,2}	EPBC Act (endangered)	Threatened	Airfield
Carnaby's Black Cockatoo ^{1,2}	EPBC Act (endangered)	Endangered	Airport West, Airport North, Airfield, Airport Central, Airport South
Forrest Red-tailed Black Cockatoo ^{1,2}	EPBC Act (vulnerable)	Vulnerable	Airport West, Airport North, Airfield, Airport Central, Airport South
Baudin's Black Cockatoo ^{1,2}	EPBC Act (endangered)	Endangered	Airport West, Airport North, Airfield, Airport Central, Airport South
Nationally Important Wetlands ¹	Directory of Important Wetlands in Australia	Conservation, Resource Enhancement and Multiple Use	Airport West, Airport North, Airfield, Airport Central, Airport South
Priority Flora ^{1,2}		Priority	Airfield, Airport North and Airport South
Quenda ^{1,2}		Priority 4	Airport West, Airport North, Airfield, Airport Central, Airport South
Rakali ^{1,2}		Priority 4	Airport North, Airfield
Native Bee (<i>Hyaleus globuliferus</i>) ¹		Priority 3	Airport West, Airport North, Airfield, Airport Central, Airport South
Cricket (<i>Austrosaga spinifer</i>) ¹		Priority 3	Locally Extinct
Cricket (<i>Throscodectes xiphos</i>) ¹		Priority 1	Locally Extinct
Western Swamp Tortoise habitat ¹ (requires substantial modification)	EPBC Act (critically endangered)	Critically Endangered	Locally Extinct

Table 9-3 Listed Environmental Values on Perth Airport estate

Source: Department of Biodiversity, Conservation and Attractions and Perth Airport

¹ Identified from desktop analysis of government databases

² Identified from surveys conducted on Perth Airport estate

9.8.4 Potential Impacts – Development

Development of the estate may directly or indirectly impact listed environmental values. Direct impacts may include the clearing or removal of environmental values while indirect impacts may include habitat fragmentation, creation of unviable areas of habitat, alteration of hydrological regimes and increased edge effects through weed incursion and dieback infestation.

Wildlife corridors, vegetation connectivity and environmental values will be key considerations in detailed land use and precinct planning to mitigate these impacts where possible.

9.8.5 Potential Impacts – Operation

The operation of Perth Airport may impact on listed values through pollution events, and alteration of the hydrological regime through activities such as over abstraction. Threatening processes such as weed incursion, dieback infestation, bush fire, feral animal predation, illegal access, and fly tipping (unauthorised dumping of waste) are an ongoing potential impact to natural areas and environmental values on the estate.

9.8.6 Current Management

Perth Airport undertakes land management activities such as weed control, dieback treatment and feral animal control to manage the listed environmental values on the estate.

Rehabilitation has been undertaken across the airport estate, including for the Living Stream project (open vegetated drainage channel).

9.8.7 Recent Achievements

Over the period of the Environment Strategy 2015–2019, a range of biodiversity management commitments were met including:

- extensive revegetation and planting work in association with the Living Stream project,
- ongoing bushfire management initiatives, including a fire fuel load survey for all bushland across the estate in 2017, fuel reduction burns (as required, based on the fuel load assessment and asset risk) and annual slashing and maintenance of firebreaks,
- as part of Perth Airport's commitment to managing the risk of wildlife strikes, a \$1.7 million project to net over three kilometres of open drains throughout the airfield commenced in 2017,
- detailed flora and fauna surveys undertaken across the estate during 2017 and 2018,
- review and update of the Perth Airport Bushfire Management Plan in 2019, and
- formulation of a precinct development guideline.

9.8.8 Five-Year Action Program

Initiatives to be undertaken between 2020 and 2024 as part of Perth Airport's five-year action program for biodiversity management are:

Initiatives

- 1 Develop and implement a Land and Biodiversity Management Plan, including weed, pest and dieback
- 2 Develop and implement a Conservation Significant Flora and Vegetation Management Plan

9.9 Carbon and Energy Sustainability

9.9.1 Objectives

- Increase energy efficiency of non-aviation operations and ground-based aviation operations across the estate.
- Investigate the use of renewable and low emission sources in the overall electricity mix, including tenant uptake of low emission technologies.
- Review and monitor energy usage and develop an energy strategy that includes low emissions energy options.

9.9.2 Overview

In 2008, aviation leaders signed the Global Aviation Industry Commitment to Action on Climate Change, demonstrating the industry's commitment to reducing its impact on the environment. Aviation accounts for around two per cent of total global carbon dioxide emissions and this is expected to increase to three per cent by 2050. Direct aircraft emissions are difficult for Perth Airport to reduce because fuel and combustion are required for flight and are beyond Perth Airport's control.

As a result, Perth Airport concentrates reduction and efficiency efforts on its own energy emissions and indirect emissions associated with airport operations. Perth Airport's energy use is predominantly electrical, natural gas and fuel (diesel and petroleum) based. Fuel is used to power Perth Airport's fleet of vehicles. Electricity supplied from the State grid and internally from Perth Airport's gas co-generation facility is used for lighting, heating and cooling of buildings, including airport terminals. Electricity is also used for activities such as airfield lighting (runway, taxiway and aprons), car parks and street lighting, and is also used by Perth Airport and tenants across the estate.

9.9.2.1 Transport and Fuel

Fossil fuel combustion is the largest contributor to air pollution in the world. Pollution emitted from vehicles can include:

- particulate matter,
- hydrocarbons,
- nitrogen oxides,
- carbon monoxide,
- sulphur dioxide,
- volatile organic compounds,
- benzene,
- methane, and
- other greenhouse gases.

In 2018, road transport accounted for 18 per cent of Australia's total greenhouse gas emissions and transport emissions have the highest rate of growth of any sector. Trends and travel patterns in Perth indicate that vehicle travel is the preferred method of transport. As Perth Airport continues development of the estate, there is an opportunity to integrate other modes of transport, including the new Forrestfield-Airport Link and other forms of public transport, walkable catchments and the possible future introduction of an Automated People Mover.

9.9.2 Electricity Use

Perth Airport estate is a large consumer of energy from the WA state grid, and the airport also develops and operates electricity supply infrastructure across the estate to service internal and tenant requirements. Perth Airport also generates its own power supply through a gas fired co-generation facility. In 2018, approximately 13 per cent of Perth Airport's total energy supply was provided by the co-generation facility, and 87 per cent was supplied by the WA state grid.

Perth Airport is committed to increasing the proportion of renewable energy and low emission energy sources in its energy mix, to reduce the environmental impacts of energy use and emissions which contribute to climate change. Through investigation of opportunities for renewable energy supply on the estate, such as solar power, and bioenergy fuels, Perth Airport will continue to focus on clean energy supply and energy efficiency increases in the development of the estate.

9.9.3 Potential Impacts - Development

Construction activity is expected to increase the rate of energy use at new development areas, however this is expected to reduce once construction is completed. Energy efficient measures have the potential to reduce operational costs as well as improve environmental and sustainability outcomes. Investigating energy efficient measures, as well as reducing use and adopting energy savings initiatives, presents a cost-reduction opportunity for Perth Airport.

9.9.4 Potential Impacts - Climate Change

Energy use and associated emissions have been identified as a major contributor to climate change. The estate is a large consumer of energy in Western Australia, and therefore Perth Airport has an obligation to reduce greenhouse gas emissions.

9.9.5 Current Management

Perth Airport's management of energy use is addressed through plans, strategies and initiatives outlined below.

9.9.5.1 Building Management System

Energy management in Perth Airport operated terminals is undertaken through the Building Management System (BMS). The BMS controls lighting, ventilation, heating and cooling, with the ability to sense and respond to changes in temperature. This system enables Perth Airport to continually identify and implement energy efficiency measures. The BMS is subject to consistent review and upgrades.

9.9.5.2 Green Star Building Design

Green Star is a voluntary, national environmental rating system that evaluates the environmental design and construction of buildings throughout all stages of a project. It assigns points for initiatives against defined categories, including site selection, design, construction, operation and maintenance. Ratings are assigned as 4 Star (Best Practice), 5 Star (Australian Excellence) or 6 Star (World Leader). Perth Airport currently has one building rated 4 Star (Bravo Building) and two rated 5 Stars (the Echo 1 & 2 Buildings) and specific ratings will be further considered as part of building approvals across Perth Airport.

9.9.5.3 Carbon Management Plan

In 2018, Perth Airport developed a Carbon Management Plan (CMP) as part of its Airports Carbon Accreditation (ACA) certification process. The CMP outlines Perth Airport's goals and performance objectives for renewable energy uptake, emissions reductions targets, and implementation plan for achieving these goals. The CMP is reviewed annually as part of the accreditation process and is subject to third party approval by the certifying body.

9.9.6 Recent Achievements

Over the period of the Environment Strategy 2015-2019, the energy related achievements included:

- construction of a gas-fired co-generation plant, as an alternative energy source, in the Airport Central Precinct in 2015 to support Terminal 1 International, the Terminal 1 Domestic pier and Terminal 2,
- annual energy use reporting under the National Greenhouse and Energy Reporting (NGER) since 2016,
- ongoing investigations into alternative energy opportunities, including waste to energy and geothermal heating and cooling, as well as reviewing options through the Airport North Zero Carbon Project (2016 – 2019),
- achievement of Level 1 'Mapping' accreditation in 2017 under the Airport Carbon Accreditation programme, and achievement of Level 2 'Reduction' accreditation in 2019. The accreditation required the development of a Carbon Management Plan, emissions reductions targets and renewable energy goals,
- progressive replacement of airside and landside lighting with highly energy efficient LED light fittings,
- the sourcing of energy from the Eastern Metropolitan Regional Council's waste to energy wood pyrolysis power generation plant, located one kilometre north of the estate (due to commence operations in 2019), and
- energy use and carbon guidelines for third party commercial developments and Perth Airport buildings to be published in Design Guidelines for each planning precinct (Airport North, Airport West, Airport South and Airport Central) in 2019.

9.9.7 Five-Year Action Program

Initiatives to be undertaken between 2020 and 2024 as part of Perth Airport's five-year action program for carbon and energy management are:

Initiatives

- | | |
|---|---|
| 1 | Undertake an energy efficiency audit for all Perth Airport buildings |
| 2 | Implement carbon reduction target of 15 per cent for Perth Airport activities |
| 3 | Install Ground Power Units for the new terminal and international terminal upgrades, subject to airline partner agreement |
| 4 | Investigate opportunities to offset PAPL Scope 1 greenhouse gas emissions and staff air travel emissions |

9.10 Water Management

9.10.1 Objectives

- Increase water efficiency of non-aviation operations and ground-based aviation operations across the estate.
- Include water efficiency requirements in future developments and investigate water sensitive urban design principles for precincts on the estate.

9.10.2 Overview

Perth, and the greater south of Western Australia, has been experiencing an extended dry period since 1975. Resulting water shortages have caused Western Australian water suppliers to launch initiatives and campaigns to reduce water use across the State. Perth Airport (including its tenants and other users on the estate) is a large consumer of water in the metropolitan area. Perth Airport (and airport estate users) source scheme water and groundwater abstraction in its operations.

Perth Airport's current scheme water use between 2013 and 2018 has averaged approximately 721,000 kilolitres per year for terminals, offices, tenanted buildings etc. Additionally, approximately 650,000 kilolitres of groundwater are used for irrigation and non-potable purposes.

9.10.3 Potential Impacts – Development

Potential impacts to groundwater across the estate are predominantly associated with development and are described below. Development at the airport has the potential to impact groundwater levels, through use and abstraction of groundwater and dewatering activities. Changes to groundwater levels have the potential to impact on flora and fauna within the estate, through reduced access to water and/or inundation.

Developments at the airport are also expected to increase consumption of scheme water. This increase will result from more users on the airport estate in the form of passengers, construction staff, airport staff, contract staff and tenants. The impacts from this are the potential for inappropriate use of potable water for activities that can be alternatively sourced from non-potable resources (such as the use of scheme water for dust suppression), which leads to greater costs and waste of scarce resources.

9.10.4 Potential Impacts – Operations

The main impact of increased scheme water consumption is the increased costs to Perth Airport and potential for waste of a scarce natural resource. Increased use of scheme water results in greater pressure on the existing natural water catchments and water sources to provide more water despite decreased rainfall trends.

9.10.5 Current Management

Perth Airport's water consumption is managed through plans, strategies and initiatives as outlined below. Although located on Commonwealth land and subject to Commonwealth legislation, Perth Airport adheres to the principles of State-mandated limits on sprinkler use, and limits watering in winter, and only on allocated days where applicable.

9.10.5.1 Groundwater Metering

Groundwater abstraction and use is monitored across the estate. The network of production bores is managed to ensure that groundwater abstraction is not concentrated in any particular area, avoiding heavy drawdown and spreading the abstraction load across the estate.

9.10.5.2 Water Efficiency Management Plan

The State Government (through the Water Corporation) requires businesses using more than 20,000 kilolitres of scheme water per annum to participate in a Waterwise Business Program, which includes the production of a Water Efficiency Management Plan. Perth Airport's Water Efficiency Management Plan improves water efficiency by:

- assessing current water use on site,
- identifying inefficiencies and potential water savings, and
- identifying opportunities where other sources of water could potentially be used to substitute current scheme water use.

9.10.5.3 Landscape Master Plan

This plan incorporates water-wise principles such as the use of native water-wise plants in landscaping, as well as water saving measures such as restricting the installation of irrigation areas and reticulation design.

9.10.5.4 Irrigation Operating Strategy

This strategy commits Perth Airport to the Water Corporation sprinkler restrictions.

9.10.6 Recent Achievements

Over the period of the Environment Strategy 2015-2019, a range of commitments were met including:

- submission of an annual Water Efficiency Management Plan (WEMP) to the Water Corporation, including integration of the Water Corporation's 'Freshwater Thinking' program and the completion of potable network modelling and tenant water consumption monitoring,
- since 2017, water flow meters have been installed for all new construction projects to monitor water use,
- water efficiency guidelines for third party commercial developments and Perth Airport buildings to be published in Design Guidelines for each planning precinct (Airport North, Airport West, Airport South and Airport Central) in 2019, and
- continued engagement with the Water Corporation to investigate options for improving Perth Airport and tenant water use across the estate.

9.10.7 Five Year Action Program

Initiatives to be undertaken between 2020 and 2024 as part of Perth Airport's five-year action program for water management are:

Initiatives

- | Initiatives | |
|-------------|--|
| 1 | Develop targets and implement measures where feasible to reduce total potable water use in Perth Airport buildings and terminals |
| 2 | Conduct a water use audit of the Perth Airport estate |
| 3 | Investigate the use of alternative water sources for irrigation and dual reticulation for key development projects |
| 4 | Engage with the top 10 water users on the estate to develop and implement individual water efficiency plans |

9.11 Waste Management

9.11.1 Objectives

- Reduce waste, increase reuse and recycling through Perth Airport's operations and to manage the remainder in the most sustainable way.
- Develop a Waste Management Plan to drive improvement in the waste management practices across operations and projects and to promote improvement in tenant practices.
- Decrease waste generation and increase efficiency in waste stream processing across the estate.

9.11.2 Overview

The Perth Airport estate produces waste from everyday operations. A wide range of waste types are generated by various businesses and tenants on the estate. Perth Airport is responsible for waste generated from Perth Airport owned and operated buildings and from estate management.

The majority of this waste ends up in landfill. Ambitious waste management targets have been proposed by the State Government in the Waste Strategy 2030 for Western Australia (in draft as at March 2019), including reducing waste by 20 per cent by 2030, and increasing material recovery to 70 per cent by 2025 and 75 per cent by 2030. Implementation of improved waste management at Perth Airport, to support the State Government's proposed strategy, will provide positive environmental outcomes.

9.11.3 Potential Impacts - Development and Operations

Development and related activities have the potential to increase the amount of waste generated across the estate. The anticipated increase would be related to increased passenger numbers and aircraft movements, increased construction activities and the associated waste products due to these increases. Disposal of waste is a material cost in the operation of the airport. Reducing use and adopting waste reduction initiatives present a cost-reduction opportunity for Perth Airport. Additionally, waste generation and disposal have indirect links to climate change such as increased methane and landfill by-products, and increased emissions from manufacturing.

9.11.4 Current Management

Perth Airport's management of waste is achieved through plans, strategies and initiatives including:

Waste Management Review

During FY2017/18 an external review of the waste management system was completed for Perth Airport's operations, with a primary focus on the domestic and international terminals. The review indicated a number of areas where improved waste management practices were required, along with additional data collection and planning requirements. The outcomes of the review provide the basis for team planning and operational review.

Recycling

Recycling is undertaken in airport terminals as well as in Perth Airport office buildings. Materials recycled include cardboard, paper, glass, aluminium and plastic drink containers (comingled waste). In addition to recycling of general waste, Perth Airport also reuses road and other construction related materials for pavements and other airfield and estate purposes.

Surveillance

Bins on the estate are under surveillance to discourage unauthorised disposal of materials.

9.11.5 Recent Achievements

The waste management initiatives that were achieved over the period of the Environment Strategy 2015-2019 include:

- investigation of technologies and behaviour change strategies to reduce paper use by Perth Airport, with grey-scale and double-side defaults and 'follow me' printing functionality implemented in 2015,
- in 2016, waste management was included as a requirement for tenants and contractors to address in construction and operational Environment Management Plans,
- improved waste sorting and increased waste recovery and diversion of waste from landfill, facilitated by a new Cleanaway offsite recycling facility opened in 2017,
- completion of a waste systems review in 2018, to identify current waste management and existing waste management contracts,
- launch of the Perth Airport Sustainability Strategy in 2018, with Perth Airport committing to the development of a Waste Management Plan to drive improvement in waste management practices,
- regular discussions with airport tenants about waste reduction opportunities through the quarterly Airport Consultative Environmental and Sustainability (ACES) group forums and the tenant environmental audit programme, and
- waste reduction and recycling measures implemented and promoted across the airport estate, including the increased use of recyclable coffee cups in food and beverage outlets and voluntary implementation of the single-use plastic bag ban by the majority of retail tenants.

9.11.6 Five Year Action Program

Initiatives to be undertaken between 2020 and 2024 as part of Perth Airport's five-year action program for waste management are:

Initiatives

- | | |
|---|--|
| 1 | Develop and publish construction and demolition waste reduction targets |
| 2 | Undertake a feasibility study for a container deposit scheme to align with State targets |

9.12 Air Quality Management

9.12.1 Objective

- Manage non-aviation air emissions across the Perth Airport estate consistent with relevant legislative requirements.

9.12.2 Overview

Air quality encompasses dust, particulates, odour and gaseous emissions. Aircraft emissions are governed by the Air Navigation (Aircraft Engine Emissions) Regulations and are the responsibility of the aircraft operators. As such, they are not covered within the scope of this Environment Strategy. Air quality on the estate is assessed against the AEP Regulations.

Perth Airport is required to report emissions from operational activities and energy use as part of the National Pollutant Inventory (NPI). Emissions calculated under the NPI are compared to the closest local monitoring station. This station is operated by the State Department of Water and Environmental Regulation and is situated in Caversham, approximately ten kilometres from Perth Airport.

The Caversham station has been verified as a relevant and appropriate real-time monitoring location for Perth Airport. A number of National Environment Protection Measures (NEPMs), produced by the National Environment Protection Council (NEPC), are directly relevant to Perth Airport. Perth Airport's activities are currently below the reporting threshold for the National Greenhouse and Energy Reporting System (NGERS).

Additionally, State regulations and best practice guidelines are used as a tool to monitor and manage air emissions. Perth Airport recognises that the ground-based activities undertaken on the airport estate, including those of tenants, have the potential to impact air quality. Sources of emissions and air quality impacts from Perth Airport and tenant ground-based activities include dust generation, odour and point source emissions.

9.12.3 Potential Impacts - Development

Air quality has the potential to be impacted by various stages of development on the estate. Increased use of construction equipment can affect the local air quality through direct emissions from machinery, as well as a potential increase in dust emissions from vegetation clearing and soil disturbance. Increases in vehicle movements on the estate will also result in an increase of combustion emissions.

9.12.4 Potential Impacts - Operations

Airport estate operations have the potential to impact air quality. This may be through dust generation or odour emissions above levels associated with standard operations. Aircraft painting activities and fire-fighting training exercises also have the potential to affect local air quality through release of fumes and smoke. Storage and handling of fuels have the potential to impact air quality. There are also emissions to air from spillages of aviation fuel, which also have the potential to emit odour-causing vapours.

9.12.5 Current Management

Air emissions from non-aeronautical activities at Perth Airport are monitored through the AEP Regulations and other Commonwealth Government mechanisms, such as Ministerial conditions to an MDP. Perth Airport undertakes a risk assessment of impacts to local air quality from all proposed developments. Prior to construction activities, the potential for dust, other air and environmental emissions is considered in the risk assessment process. Measures to minimise the potential for dust and contingencies are outlined in a construction EMP and then implemented during construction activities.

The estate also contains industry types that have the potential to impact air quality. These industries are required to monitor air quality, with some having continuous monitoring in place to detect any potential exceedances that may need to be investigated and rectified. This management of tenant emissions is addressed through operational EMPs. Tenant air quality monitoring data is also reviewed for compliance with the AEP Regulations and commitments within EMPs and/or MDP conditions. If exceedances of the AEP Regulations occur from tenant activities, Perth Airport will work with the tenants and Department of Infrastructure, Transport, Regional Development and Communications to ensure appropriate corrective actions are implemented.

9.12.6 Recent Achievements

Over the period of the Environment Strategy 2015-2019, a range of commitments were met including:

- through the Perth Airport development application and consent process (detailed in Section 11), new development and project proposals are assessed to ensure any significant new emission source complies with the AEPR and relevant Western Australian air quality guidelines,
- Perth Airport completes annual emission reporting to the National Pollutant Inventory (NPI), and since 2016, the National Greenhouse and Energy Reporting Scheme (NGERS),
- through working with a key tenant on air quality monitoring results, improvements to the tenant's emissions control equipment were implemented in 2017, and
- in 2017, air quality, odour and greenhouse gas assessments were completed for current (2016) operations, and forecast for 2025 without the new runway, 2025 with the new runway (subject to approval), and at 2045. Findings of the assessments, and identified mitigation measures, were published in the Preliminary Draft Major Development Plan for the New Runway Project.

9.12.7 Five Year Action Program

Initiatives to be undertaken between 2020 and 2024 as part of Perth Airport's five-year action program for air quality management are:

Initiatives

- 1 Install short-term air quality monitor(s), or conduct monitoring as required to evaluate the current baseline and update air quality model/s
- 2 Create inventory of ozone-depleting substances used by Perth Airport and phase out substances with high ozone depletion and global warming potential

9.13 Ground-based Noise Management

9.13.1 Objective

- Manage and minimise noise levels associated with ground-based airport operations and development.

9.13.2 Overview

Perth Airport recognises the importance of appropriate ground-based noise management. Aircraft noise during flight, including take-off and landing, is managed directly by the Department of Infrastructure, Transport, Regional Development and Communications through the *Air Navigation Act 1920* (Cth) and *Air Navigation (Aircraft Noise) Regulations 1984* (Cth) and is outside the scope of this Environment Strategy.

Perth Airport recognises that aircraft noise is an important issue for the community. Perth Airport works closely with Airservices Australia, airline partners, and Commonwealth, State and Local Governments to manage the impacts of aircraft noise on the community. Aircraft noise management is detailed in Section 7.

This Environment Strategy addresses ground-based noise impacts (that is, noise not generated by aircraft during flight, take-off and landing) which are managed at federally leased airports through the *Airports Act* and the *AEP Regulations*. The *AEP Regulations* include a general duty to prevent offensive noise. Where prevention is not practical, the duty to minimise the generation of offensive noise applies.

Schedule 4 of the *AEP Regulations* provides Excessive Noise Guidelines which establish a set of indicators to determine if noise is excessive and provides guidance for consideration of sensitive and commercial receptors. Perth Airport considers *Environmental Protection (Noise) Regulations 1997 (WA)* for development related projects that have the potential to impact sensitive receptors.

9.13.3 Potential Impacts

The following impacts have been identified, including risks and influences, relevant to ground-based noise during the period of this Environment Strategy.

Aviation and non-aviation operation sources of ground-based noise that may be experienced include:

- ground-based aviation noise:
 - aircraft ground-running,
 - maintenance on engines, including ground testing,
 - movement of passengers and goods on/off aircraft,
 - aircraft refuelling and operational activities, and
 - operation of aircraft auxiliary power units.
- ground-based non-aviation noise:
 - road traffic,
 - construction and demolition activities, and
 - tenant plant and operational activities.

9.13.4 Current Management

Noise arising from engine ground-running is managed through an Engine Ground Run Management Plan. Constraints on conducting engine ground-running above idle are implemented by Perth Airport including time of day, power setting and location. Aircraft operators must seek approval from Perth Airport if a proposed engine run cannot be conducted in accordance with the defined constraints.

Construction EMPs address noise pollution caused by construction activities and are a key control for noise exposure during development at Perth Airport. Operational activities of tenants which pose a risk of emitting offensive noise are required to incorporate noise minimisation strategies in the operational EMPs. Where considered necessary, noise modelling is undertaken to assess potential noise impacts. Monitoring of ground-based noise is not conducted routinely by Perth Airport, however monitoring may be conducted in association with commitments made through EMPs and MDPs.

9.13.5 Recent Achievements

Over the period of the Environment Strategy 2015-2019, the following commitments were met:

- annual examination of noise complaints, to determine patterns on surrounding communities and consider the impact of metrological weather conditions on ground run noise events,
- in 2018, the Engine Ground Running (EGR) Management Plan was amended to introduce restrictions on ground runs between 11:00pm and 5:30am, with dispensations only granted in exceptional circumstances,
- ground-based noise modelling was undertaken, for the first time, in 2017. To establish a baseline, real-time noise loggers were placed at six residences around the airport estate. Forecasts were published in the Preliminary Draft Major Development Plan for the New Runway Projects for both typical and worst-case meteorological conditions for 2016, 2025 without the new runway, 2025 with the new runway, and 2045.

9.13.6 Five Year Action Program

Initiatives to be undertaken between 2020 and 2024 as part of Perth Airport's five-year action program for ground-based noise management are:

Initiative	
1	Undertake further short-term monitoring of ground-based noise exposure and identify opportunities for improvement

9.14 Contamination and Hazardous Material Management

9.14.1 Objectives

- Implement best practice environmental controls for the prevention and management of spills and release of hazardous materials.
- Prevent contamination of soil within the estate.
- Manage and investigate known or potentially contaminated sites in accordance with relevant legislation.

9.14.2 Overview

Perth Airport estate operations require the storage, handling and use of various hazardous materials and chemicals. The most significant hazardous material used on the estate is aviation fuel. There are two main fuel distribution depots on the estate:

- the Joint Operations Supply Facility (JOSF), located in the Airport West Precinct (in proximity to Terminal 3 and Terminal 4 and the General Aviation Area), and
- the Joint User Hydrant Installation (JUHI), which is located in Airport Central (in proximity to Terminal 1 and Terminal 2).
- Other activities involving the use of hazardous materials include:
 - maintenance facilities operated by airport tenants,
 - material used for fire-fighting,
 - construction and related activities, and
 - the storage and use of fuels and oils (other than aviation fuel), solvents, paints, pesticides and herbicides.

Asbestos has also been identified on the estate, an asbestos register is maintained to manage the risk of exposure and guide remedial activities. Incorrect use, handling, or transport of hazardous materials and chemicals can impact the environment and human health. Regulatory tools, such as the AEP Regulations, *Dangerous Goods Safety Act 2004* (Cth) (DG Act) and other requirements, are in place to assist with the management of hazardous materials and other chemicals.

9.14.3 Potential Impacts

Spills of hazardous materials have the potential to impact adversely on the environment if not captured and managed appropriately. They can impact the receiving environment via:

- soil,
- surface and groundwater,
- vegetation and flora,
- fauna, and
- human health.

9.14.4 Current Management

Management measures currently in place for hazardous material use, storage and transport on the estate are described below.

Prior to the approval of development activities on the estate, assessments are undertaken on the historical use of the area to determine if hazardous materials have the potential to remain on the site. This assessment is then used to ensure appropriate management of the site during development activities which may include remediation or ongoing monitoring. A site asbestos register is maintained by Perth Airport for the management of asbestos within buildings. During construction activities, measures are put in place to ensure any asbestos contaminated soil and materials are handled, managed and disposed of appropriately, in accordance with regulations and best practice guidance.

Responsibility for prevention of spills on the estate during fuel transportation (pipes) and refuelling of aircraft lies with the refuelling companies and the airlines. In the event of a spill, Perth Airport implements spill management procedures. Management of spills on tenants' premises are the responsibility of tenants, however Perth Airport provides advice and assistance to tenants, and ensures appropriate management and remedial action is undertaken.

9.14.5 Per- and Poly-Fluoro Alkyl Substances (PFAS) Management

Perth Airport is committed to the appropriate assessment, management and remediation of PFAS on the estate to ensure the safety of our people and communities and protection of the environment. PFAS management on the airport estate will be informed by a detailed site investigation to be completed in late 2019. It is recognised that PFAS needs to be managed in a variety of ways defined within a whole of estate PFAS Management Plan, with site appropriate actions implemented on a project by project basis.

Perth Airport recognises consideration of holistic and multi-disciplinary approaches to achieve its PFAS management objective. This PFAS Management Strategy is represented in Figure 9-13 and outlines key areas of focus which will be addressed to meet the overall objective including:

- governance,
- evaluation and monitoring,
- risk management,
- management and remediation,
- stakeholder communication and engagement, and
- innovation and research.

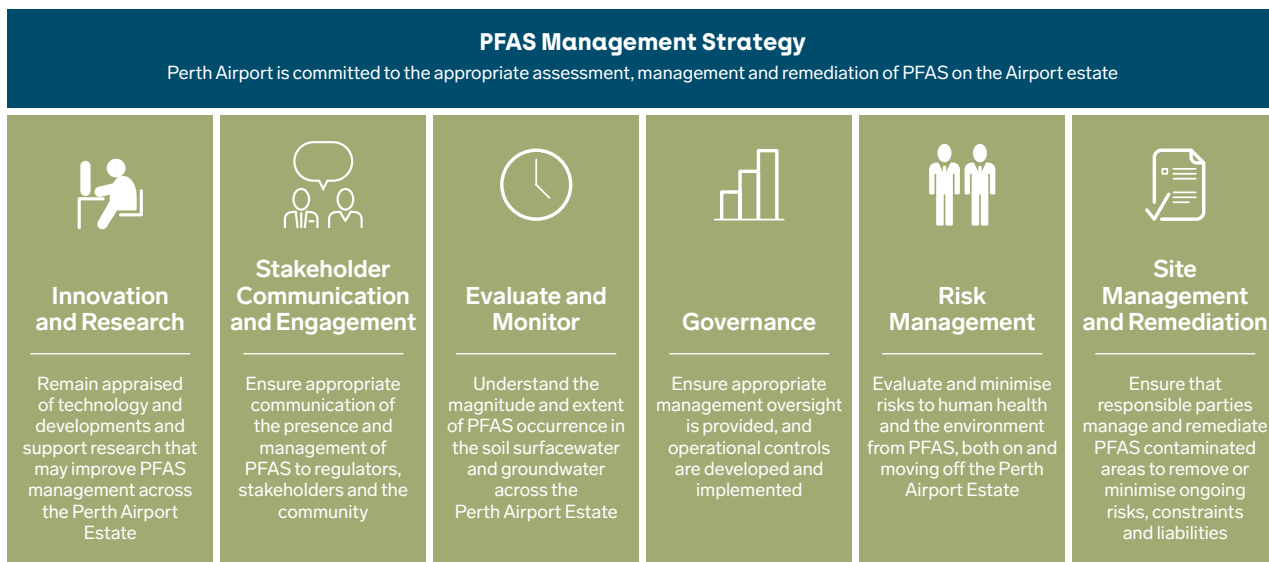


Figure 9-13 Perth Airport PFAS Management Strategy
Source: Perth Airport

9.14.6 Recent Achievements

Over the period of the previous Environment Strategy 2015-2019 a range of commitments were achieved, including:

- since 2015, PFAS assessments through groundwater and surface water monitoring have been reported quarterly to Department of Infrastructure, Transport, Regional Development and Communications, in line with PFAS National Environmental Management Plan (published January 2018) (and the prior PFC Guideline for Environmental Management GEM-002),
- an audit of underground and above ground fuel storage tanks was completed in 2016 for Perth Airport and key tenant buildings and facilities, to clarify potentially hazardous material activities across the estate,
- a review of dangerous goods storage and the use of PFAS in fire suppressant systems was undertaken across the estate in 2017 to inform a risk assessment and management plans for potential contaminating activities,
- in 2017, Perth Airport developed a PFAS Management Strategy to guide and inform the airport's approach to PFAS governance, evaluation and monitoring, risk management, remediation, stakeholder communication and engagement, and innovation and research,
- PFAS intervention trials were undertaken in the Northern Main Drain, with a passive in-stream granular activated carbon (GAC) trial in 2017, and active pump and GAC treatment trial in 2018,
- an on-site spill response contractor was engaged by Perth Airport in 2018 to improve response to airside and landside spills, and
- management by Airservices Australia of areas impacted by the historic use of aqueous film forming foams by Aviation Rescue and Fire Fighting Services has progressed, with Airservices completing a preliminary site investigation (released in 2019).

9.14.7 Five Year Action Program

Initiatives to be undertaken between 2020 and 2024 as part of Perth Airport's five-year action program for contamination and hazardous material management are:

Initiatives

1	Engage with regulators and Airservices Australia to determine appropriate remedial options for PFAS within the estate
2	Develop a PFAS Management Plan for the Perth Airport estate
3	Undertake an audit of dangerous goods storage across the estate

9.15 Aboriginal Heritage and Engagement

9.15.1 Objectives

- Proactively engage with members of the Aboriginal community to promote cultural awareness within Perth Airport estate and users of Perth Airport.
- In consultation with members of the Aboriginal community, identify and implement initiatives that promote Aboriginal culture and reconciliation.
- Manage listed Aboriginal sites in a culturally sensitive manner and in accordance with relevant legislation.

9.15.2 Overview

The land on which Perth Airport is located forms part of the traditional network of communication routes, meeting places and camping sites of the Noongar people. As the Traditional Custodians of the land, the Noongar people maintain a strong interest in the airport land and its management.

A number of archaeological and ethnographic sites have been identified within the airport estate. These sites are registered on the State Department of Planning, Lands and Heritage (DPLH) Register of Aboriginal Sites, as shown in Figure 9-14. The Western Australian *Aboriginal Heritage Act 1972* (AH Act) provides for the preservation, on behalf of the community, of places and objects customarily used by the original inhabitants of Australia or their descendants. All Aboriginal heritage sites that meet the definition of Section 5 of the AH Act are protected, whether or not they are included in the Register of Aboriginal Sites.

The strong connection between members of the Aboriginal community and the land on which Perth Airport is situated is recognised in a Partnership Agreement reached in 2009 between Perth Airport, Traditional Custodians of the land and other Aboriginal Elders. The agreement was made in a spirit of cooperation and commitment to fostering cultural heritage as the development of Perth Airport proceeds. Signatories to the Agreement meet regularly to discuss airport planning, cultural awareness activities, sponsorship opportunities and cultural history.

9.15.3 Governance

Generally, Australia's State and Territory Governments are responsible for the protection of Aboriginal heritage places and objects. The AH Act is the key State legislation applicable to Aboriginal heritage in Western Australia.

The Commonwealth *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* can protect areas and objects that are of particular significance to Aboriginal people. This Act enables the Commonwealth to respond to requests to protect areas and objects that are under threat, if it appears State laws have not provided effective protection.

Changes to State and Commonwealth legislation, policy and approaches to managing Aboriginal heritage have the potential to both positively and/or negatively impact how Perth Airport is required to, or is able to, engage with members of the Aboriginal community on matters of Aboriginal heritage.

9.15.4 Potential Impacts

Developments on the Perth Airport estate have the potential to impact Aboriginal heritage and engagement, such as:

- an increase in ground disturbing activity that may either directly or indirectly impact on known and unknown sites, and
- altering natural values with the removal or disturbance of wetlands and vegetation that may impact the Aboriginal community's connection to the land.

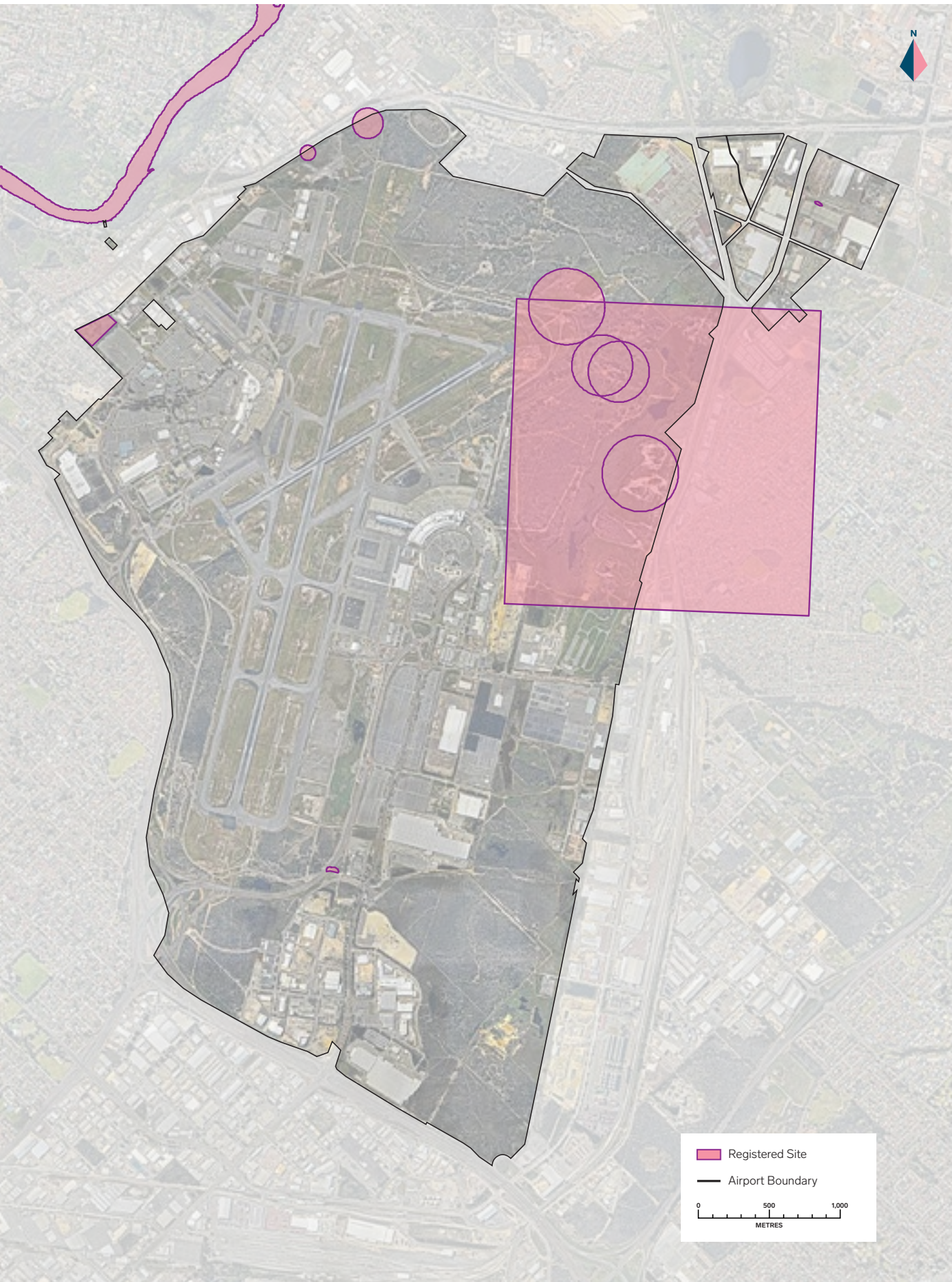


Figure 9-14 Registered Aboriginal Sites
Source: Department of Planning, Lands and Heritage 2019

9.15.5 Current Management

Perth Airport's Heritage Management Framework, which guides the management of Aboriginal cultural heritage within the estate, is underpinned by a Heritage and Engagement Policy and a Cultural Heritage Management Plan.

The Perth Airport Heritage and Engagement Policy is focused on identifying opportunities and developing a sense of place that recognises the Noongar people as the Traditional Custodians of the land on which Perth Airport is located. Future projects will identify and implement initiatives that focus on creating an environment that acknowledges and celebrates Aboriginal culture while enriching passenger experience.

In 2009, Perth Airport entered into a Partnership Agreement with Traditional Custodians and other Aboriginal Elders who have a longstanding association with the airport estate. The Agreement was signed by seven Noongar families (represented on Perth Airport's Partnership Agreement Group (PAG) and recognises the willingness of the signatories to engage in good faith for the ongoing development of the airport and Aboriginal heritage. Through the Partnership Agreement, Perth Airport has committed to a range of initiatives to recognise and promote cultural heritage on the estate, including:

- establish and facilitate a high-level Aboriginal heritage steering group to facilitate ongoing communication, with meetings held at least three times per year,
- include the Traditional Custodians and other Aboriginal Elders in the land use planning process as part of the regular steering group,
- implement an annual schedule of events to celebrate and enhance awareness of Aboriginal heritage and culture at Perth Airport,
- continue to undertake activities in a manner that complies with the AH Act, including consultations where required,
- continue to have Munday Swamp available for cultural activities,
- sponsor projects to benefit the local Aboriginal community,
- employ members of the Aboriginal community in cultural heritage awareness and land management planning activities, and
- annually, provide two three-year scholarships for Aboriginal students undertaking university study.

Through consultation with PAG and other cultural knowledge holders, Perth Airport is currently developing a cultural narrative and engagement framework that is modelled on the leading work completed by the WA Government and the Metropolitan Redevelopment Authority. The framework promotes the integration of a heritage narrative into the development of projects. A key project currently being considered is a cultural audio soundscape being designed for the Forrestfield-Airport Link 'Skybridge' pedestrian walkway linking the Airport Central rail station to Terminal 1, to be completed in 2020.

The Cultural Heritage Management Plan provides a strategy to protect and manage Aboriginal and State cultural heritage on the Perth Airport estate. The Plan aims to:

- ensure compliance with relevant State and Commonwealth heritage and Aboriginal heritage legislation, policy and guidelines,
- outline measures to be taken before, during and after an activity in order to protect Aboriginal cultural heritage in an activity area,
- acknowledge and respect the connection Traditional Custodians have to the land and waters on which Perth Airport operates,
- identify opportunities to meaningfully engage with Traditional Custodians,
- strengthen the relationships with the local Noongar community, and
- promote and recognise heritage across the Perth Airport estate.

Heritage assessments and consultation with the PAG and other cultural knowledge holders ensure that potential impacts to Aboriginal heritage values from development and ongoing operation of the airport are considered, managed and mitigated where possible. The results obtained from consultations, heritage assessments and subsequent archaeological and ethnographic investigations continue to be used by Perth Airport to inform the short and long-term planning, operation and development of the estate.

9.15.6 Recent Achievements

Over the period of the Environment Strategy 2014-2019, a range of heritage management and engagement commitments were achieved, including:

- the Aboriginal Heritage Framework, which guides the management of Aboriginal cultural heritage within the estate, was updated in 2016. The revised Framework has been developed in accordance with the Aboriginal Heritage Due Diligence Guidelines published by the State Government,
- outcomes from the Aboriginal Oral History Project, which recorded historical stories from Aboriginal persons who lived in the vicinity of the airport estate, have been incorporated into project design elements. A key initiative has been the installation of a Welcome to Country message, in Noongar and English, in the T1 International arrivals concourse and in the T4 arrivals area in 2019,
- key Perth Airport staff completed cultural awareness training in 2018,
- a heritage consultant was engaged in 2018 to identify options to archive and house artefacts recovered from heritage sites on the estate, and
- following the establishment of a dedicated Procurement Team in 2017, Perth Airport identified voluntary tender selection criteria and the use of special measures as sensible procurement practice likely to influence the increased engagement of Aboriginal people within the supply chain.

9.15.7 Five Year Action Program

Initiatives to be undertaken between 2020 and 2024 as part of Perth Airport's five-year action program for heritage management and engagement are:

Initiatives

- | Initiatives | |
|-------------|---|
| 1 | In consultation with Traditional Custodians, install a Welcome to Country message in Noongar and English in all terminals |
| 2 | In consultation with Traditional Custodians, develop a list of culturally appropriate Noongar words for the naming of new roads within the estate |
| 3 | In consultation with Traditional Custodians, develop and implement a Heritage Site Land Management Plan for heritage sites within the estate |
| 4 | Engage Aboriginal businesses and/or groups to undertake land management works at Kwenda Malark, Redcliffe Wetlands and/or Munday Swamp |
| 5 | In consultation with Traditional Custodians, complete the concept design for an interpretive walking trail linking Munday Swamp to the Swan River |
| 6 | Implement cultural awareness training for all Perth Airport employees |
| 7 | Develop and implement a Reconciliation Action Plan |
| 8 | Conduct a historical heritage assessment of the estate |

9.16 Five Year Environment Strategy and Heritage Management and Engagement Implementation Plan

The following implementation plan brings together the individual initiatives outlined in previous sections, with the nomination of completion timeframes for each initiative.

	Completion Timeframe
Environmental Management Initiative	
1 Certify the Environmental Management System to ISO 14001	2023
2 Engage with tenants and airport operators to promote and improve sustainability performance across the estate	Ongoing
3 Develop and publish an annual report on sustainability performance	2021 onwards
4 Develop and publish a sustainable procurement policy to guide Perth Airport purchasing and contracting	2020
5 Review and update the Precinct Development Guidelines to incorporate: <ul style="list-style-type: none"> • water, waste, carbon and energy objectives, • biodiversity and land management guidance, and • environmental, social and governance. 	2021
Soil Management Initiative	
1 Undertake further dieback assessment	2024
Groundwater and Surface Water Management Initiative	
1 Develop and implement a Groundwater Extraction Management Plan (including surface water where appropriate) for monitoring and management of Perth Airport and tenant groundwater extraction	2020
2 Undertake monitoring of macroinvertebrates in natural water bodies to coincide with international terminal upgrades, new terminal and/or New Runway Project	2023
3 Incorporate water sensitive urban design principles in Design Guidelines for on estate developments	2024
Biodiversity Management Initiative	
1 Develop and implement a Land and Biodiversity Management Plan, including weed, pest and dieback	2022
2 Develop and implement a Conservation Significant Flora and Vegetation Management Plan	Develop 2021 Implement 2023
Carbon and Energy Management Initiative	
1 Undertake an energy efficiency audit for all Perth Airport buildings	2020
2 Implement carbon reduction target of 15 per cent for Perth Airport activities	2023
3 Install Ground Power Units for the new terminal and international terminal upgrades, subject to airline partner agreement	2023
4 Investigate opportunities to offset PAPL Scope 1 greenhouse gas emissions and staff air travel emissions	2020
Water Management	
1 Develop targets and implement measures where feasible to reduce total potable water use in Perth Airport buildings and terminals	2020-2024
2 Conduct a water use audit of the Perth Airport estate	2020
3 Investigate the use of alternative water sources for irrigation and dual reticulation for key development projects	2020-2024
4 Engage with the top 10 water users on the estate to develop and implement individual water efficiency plans	2022
Waste Management Initiative	
1 Develop and publish construction and demolition waste reduction targets	2021
2 Undertake a feasibility study for a container deposit scheme to align with State targets	2020

Air Quality Management Initiative		
1	Install short-term air quality monitor(s), or conduct monitoring as required to evaluate the current baseline and update air quality model/s	2020
2	Create inventory of ozone-depleting substances used by Perth Airport and phase out substances with high ozone depletion and global warming potential	2023
Ground-based Noise Management Initiative		
1	Undertake further short-term monitoring of ground-based noise exposure and identify opportunities for improvement	2021
Contamination and Hazardous Material Management Initiative		
1	Engage with regulators and Airservices Australia to determine appropriate remedial options for PFAS within the estate	2021
2	Develop a PFAS Management Plan for the Perth Airport estate	2020
3	Undertake an audit of dangerous goods storage across the estate	2024
Aboriginal Heritage and Engagement Initiative		
1	In consultation with Traditional Custodians, install a Welcome to Country message in Noongar and English in all terminals	2020-2024
2	In consultation with Traditional Custodians, develop a list of culturally appropriate Noongar words for the naming of new roads within the estate	2020
3	In consultation with Traditional Custodians, develop and implement a Heritage Site Land Management Plan for heritage sites within the estate	2021
4	Engage Aboriginal businesses and/or groups to undertake land management works at Kwenda Malark, Redcliffe Wetlands and/or Munday Swamp	2020-2024
5	In consultation with Traditional Custodians, complete the concept design for an interpretive walking trail linking Munday Swamp to the Swan River	2022
6	Implement cultural awareness training for all Perth Airport employees	2020 and ongoing
7	Develop and implement a Reconciliation Action Plan	2020
8	Conduct a historical heritage assessment of the estate	2020

