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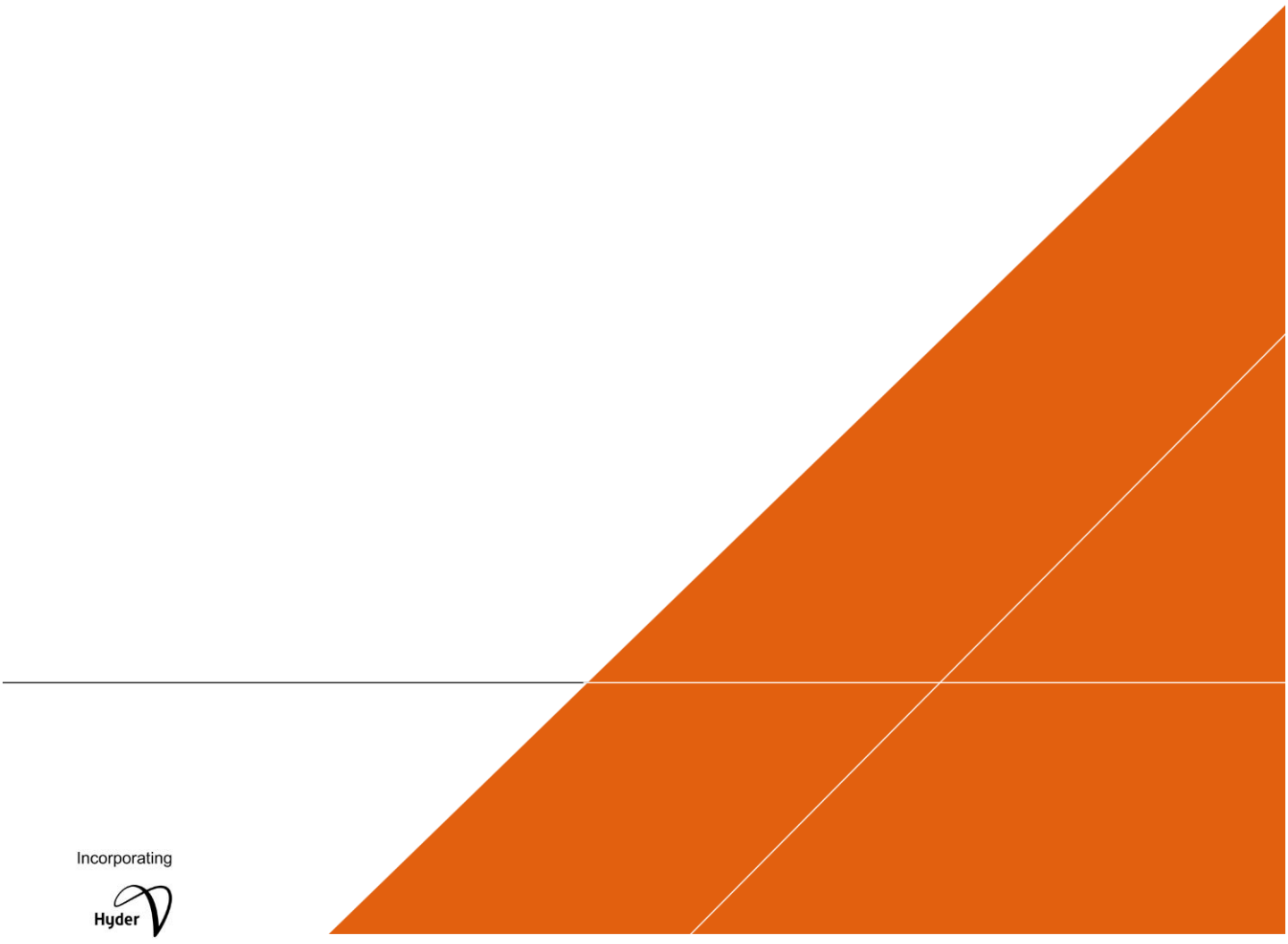
CAIRNCROSS LANDFILL EXPANSION

Environmental Impact Statement

10 NOVEMBER 2017



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PORT MACQUARIE HASTINGS COUNCIL

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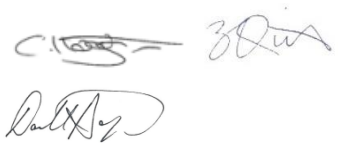
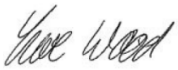
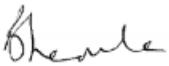
Author	Zoe Wood, Danielle Haynes, Zachary Quintal, Claire Hodgson	
Checker	Zoe Wood	
Approver	Brad Searle	

Report No	1
Date	10/11/2017
Revision Text	A

REVISIONS

Revision	Date	Description	Prepared by	Approved by
A	10/11/2017	FINAL EIS	Zoe Wood	Brad Searle

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STATEMENT OF VALIDITY

Submission of Environmental Impact Statement

Prepared under Part 4, Division 4.1 (State Significant Development) of the Environmental Planning and Assessment Act 1979

Environmental Assessment prepared by

Name:	Zoe Wood
Qualifications:	BA, MEnvSc
Address:	Level 15, 580 George Street Sydney, NSW 2000
In respect of:	Cairncross Landfill Expansion
Applicant Name:	Port Macquarie Hastings Council (PMHC)
Applicant Address:	Cnr Lord & Burrawan St, Port Macquarie, NSW 2444
Proposed development:	The Proposal includes the following key components, which together comprise the proposed development: PMHC is seeking approval under Part 4, Division 4.1 of the EP&A Act to expand the existing Cairncross Landfill located at the Cairncross WMF. The Proposal will receive waste from all areas within the PMHC LGA including the major townships of Port Macquarie, Wauchope and Camden Haven. Waste will include general solid waste (i.e. putrescible and non-putrescible materials) and asbestos from domestic and C&I sources. The key works for which approval is sought include: • Progressive landfill cell construction, operation and rehabilitation of three landfill stages (Stages 1-3) including: – Clearing of existing vegetation – Construction of access tracks – Earthworks for cell formation including extraction and stockpiling of materials and the reapplication to form the leachate barrier (cell liner) as well as for daily, intermediate and final cover – Installation of leachate management structures including the leachate barrier, collection, storage and disposal system – Construction of a rising main to transfer leachate to the adjacent sewerage treatment plant (STP)[1] – Installation of a stormwater management system – Progressively increasing the annual waste acceptance rate at the landfill – Signage and other ancillary works – Rehabilitation of closed cells.

[1] The STP is proposed to be built in 2018 and is being designed to be capable of accepting leachate from Stages 1-3 of the Proposal.

	• Delineation and ongoing management of an approximately 50 m wide Koala connectivity corridor around the south-western border of the site. Stages 1-3 of the Proposal are expected to receive a total of approximately 3.2 million tonnes of additional waste over the life of the expanded landfill and would be developed in stages as described in Section 5. The overall landfill life expectancy is 36 years (i.e. Stage 3 is expected to reach capacity in approximately 2056).
Land to be developed:	The Proposal Site is owned by PMHC. A summary of the legal description (i.e. Lot and Deposited Plan (DP) references) of the Proposal site includes: ▪ Lot 1 / DP 1202080, 8395 Pacific Highway, Telegraph Point, NSW (core Proposal Site). The Proposal Site is shown in Figure 1-2
Environmental Impact Statement:	An EIS is attached which addresses all matters in accordance with Part 4 (Division 4.1) of the *Environmental Planning and Assessment Act* 1979 and Schedule 2, Part 3, clause 7(1)(e) of the *Environmental Planning and Assessment Regulation 2000*. I certify that I have prepared the contents of this EIS in accordance with the Secretary's Environmental Assessment Requirements (SEARs) (Ref SSD 13_5792) dated 7 May 2015, and that to the best of my knowledge, the information contained within this EIS is not false or misleading.
Signatures:	
Name:	Zoe Wood
Date:	10/11/2017

GLOSSARY

Term	Meaning
AADT	Annual average daily traffic
ABPP	Australian Bushfire Protection Planners
AHIMS	Aboriginal Heritage Information Management System
AHIP	Aboriginal Heritage Impact Permit
ARI	Average recurrence interval
ASD	Approach Sight Distance
ASS	Acid sulfate soils
AUD	Australian Dollars
AWT	Alternate Waste Technologies
BAR	*Biodiversity Assessment Report*
BBAM	Biobanking Assessment methodology
BOM	Bureau of Meteorology
C&D	Construction and demolition
C&I	Commercial and industrial
Cairncross Landfill	Collective term for the existing and proposed landfill that is located within the Cairncross WMF
Cairncross WMF	Cairncross Waste Management Facility
Cairncross WMF Access Road	The main access road from the pacific Highway to the Proposal Site (previously known as Forest Hut Road)
CH_4	Methane
CIV	Capital Investment value
CLM Act	*Contaminated Land Management Act 1997*
CO_2	Carbon Dioxide
$CO_{2\text{-}e}$	Carbon Dioxide Equivalent
Concept Design Report	Concept Design Report prepared by PMHC (2017)
CPM	Carbon Price Mechanism
CRC	Community recycling centres
DA	Development application

Term	Meaning
Dangerous Goods Code	*Australian Code for Transportation of Dangerous Goods by Road and Rail* Edition 7.5
Development Site	In this assessment, the Development Site is considered to comprise of the 3.4 hectares' area of native vegetation within the Proposal Site that is not already subject to approval for clearing and is shown in Figure 8-2
DECC	Department of Environment and Climate Change NSW
DG	Director-General
DGRs	Director General's Requirements
DIPNR	Department of Infrastructure, Planning and Natural Resources
Disposal Requirements Report	Cairncross Landfill Expansion: Future Disposal Capacity Requirements Report
DoE	Commonwealth Department of Environment
DoEE	Department of Energy and Environment
DPE	Department of Planning and Environment
DP&I	Department of Planning and Infrastructure
DPI	Department of Primary Industries
Dunghutti Elders	Dunghutti Elders Council Aboriginal Corporation
EIS	Environmental Impact Statement
EOI	AWT Contract Expression of Interest
EP&A Act	*Environmental Planning and Assessment Act 1979*
EP&A Regs	*Environmental Planning and Assessment Regulation 2000*
EPA	New South Wales Environmental Protection Agency
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
EPIs	Environmental Planning Instruments
EPL	Environmental Protection Licence
ERA	Environmental Risk Assessment
ERM	Environmental Resource Management
ESCP	Erosion Sediment Control Plan
ESD	Ecologically sustainable development

Term	Meaning
ETS	Carbon Emissions Trading Scheme
FOGO	Food and garden organics
FBA	*Framework for Biodiversity Assessment*
GHG	Greenhouse Gas
Guidelines	*Environmental Guidelines: Solid Waste Landfills -Second edition 2016* (NSW EPA, 2016)
Heritage Act	*Heritage Act 1977*
HHW	Household hazardous waste
INP	*NSW Industrial Noise Policy*
IPCC	Intergovernmental Panel on Climate Change
ISEPP	*State Environmental Planning Policy (Infrastructure) 2007*
LALC	Local Aboriginal Land Council
LEMP	Landfill Environmental Management Plan
LGA	Local Government Area
LOS	Level of Service
Koala connectivity corridor	The approximately 50 m wide strip of land on the southern boundary proposed to be maintained in a vegetated state to provide for Koala movements around the Proposal Site
MCA	Major Catchment Area
MNES	Matters of National Environmental Significance
MRA	MRA Consulting Group
MOUs	Memorandum of Understandings
MRF	Material Recovery Facility
MSW	Municipal solid waste
Mt	Megatonnes
NGA	National Greenhouse Accounts
N_2O	Nitrous oxide
NP&W Act	*National Parks and Wildlife Act 1974*
NPWS	National Parks and Wildlife Service
NSW AIP	New South Wales Aquifer Interference Policy

Term	Meaning
NSW 2021 State Plan	New South Wales 2021: A Plan to Make NSW Number 1
NSW EPA	New South Wales Environmental Protection Agency
OEH	Office of Environment and Heritage
OEMP	*Operational Environmental Management Plan: Cairncross Waste Management Facility* (PMHC, 2008)
ORRF	Organics Resource Recovery Facility
OSD	On-site detention
PADs	Potential archaeological deposits
PCT	Plant Community Type
PHA	Preliminary hazard analysis
PMHC	Port Macquarie Hastings Council
PMHC LEP	*Port Macquarie-Hastings Local Environment Plan 2011*
POEO Act	*Protection of the Environment Operations Act* 1997
POEO Waste Regulation	*Protection of the Environment (Waste) Regulation* 2014
Proposal	PMHC is seeking development approval to expand the existing landfill to cover the remaining area identified for landfilling in the Environmental Impact Statement that was prepared by ERM in 1999 to support the development application for the first stage of the landfill. The Proposal would involve the progressive construction, operation and rehabilitation of three landfill stages (Stages 1-3), following a staged approach with implementation over approximately 36 years.
Proposal Site	The site that is subject to the Proposal, as shown on Figure 1-1
PSNL	project-specific noise levels
RAMSAR	Wetlands of International Importance
RAP	Registered aboriginal parties
REF	Review of Environmental Factors
RMS	Roads and Maritime Services
RNP	*NSW EPA Road Noise Policy*
SEARs	Secretary's Environmental Assessment Requirements
SEPPs	State Environmental Planning Policies

Term	Meaning
SEPP 14	*State Environmental Planning Policy No. 14 (Coastal Wetlands)*
SEPP 33	*State Environmental Planning Policy No. 33 - Hazardous and Offensive Development*
SEPP 44	*State Environmental Planning Policy No. 44 – Koala Habitat Protection*
SEPP 55	*State Environmental Planning Policy No. 55 – Remediation of Land*
SEPP 64	*State Environmental Planning Policy No.64 – Advertising and Signage*
SEPP S&RD	*State and Environmental Planning Policy (State and Regional Development)* 2011
SISD	Safe Intersection Sight Distance
SMDD	standard maximum dry density
SOPs	Standard Operating Procedures
SSD	State Significant Development
Stage E	The current landfill operational area at the Cairncross WMF
STP	Telegraph Point Sewage Treatment Plant
Study Intersection	The intersection of the Pacific Highway and the Cairncross WMF Access Road.
SWL	Sound power levels
TAPM	The Air Pollution Model
TS	Threatened Species
TSC Act	*Threatened Species Conservation Act 1995*
t/pa	Tonnes per annum
TPCA	Telegraph Point Community Association
TSPD	Threatened Species Profiles Database
TWA	Trade Waste Agreement
VENM	Virgin excavated natural material
WARR	Waste avoidance and resource recovery
WARR Act	*Waste Avoidance and Resource Recovery Act 2001*

Term	Meaning
WARR Strategy	Waste Avoidance and Resource Recovery Strategy 2014-21
Waste Strategy	Port Macquarie-Hastings Council Waste Strategy: 2017 - 2024
The Water Sharing Plan	*Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016*
WBCSD	World Business Council for Sustainable Development
WM Act	*Water Management Act 2000*
WRI	World Resource Institute
WTS	Waste Transfer Station

EXECUTIVE SUMMARY

Introduction

This Environmental Impact Statement (EIS) has been prepared on behalf of Port Macquarie-Hastings Council (PMHC) to support a State Significant Development (SSD) application under Part 4, Division 4.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). Division 4.1 of the EP&A Act identifies the Minister for Planning (the Minister) as the consent authority for development that is identified as SSD.

PMHC is seeking development approval to extend Cairncross Landfill to cover the remaining area identified for landfilling in the 1999 Environmental Impact Statement (1999 EIS)[2]. The Proposal is for the expansion of the existing landfill at the Cairncross Waste Management Facility (Cairncross WMF), and would involve the progressive construction, operation and rehabilitation of three landfill stages (Stages 1-3), following a staged approach with implementation over approximately 36 years. Stage 1 would commence construction/operation in approximately 2019/2020 respectively and Stage 3 would reach capacity in approximately 2056 with a landfill closure period to follow.

Over the past two decades, PMHC have implemented a range of waste management initiatives to improve waste diversion rates throughout the local government area (LGA). Despite recent and expected future increases in diversion of waste to landfill, the annual waste acceptance rate would progressively increase over the life of the Proposal due to predicted population and waste generation growth per capita. This EIS has been prepared by Arcadis on behalf of PMHC, as the Proponent, to support an application for approval of the Proposal. It has been prepared in accordance with the Secretary's Environmental Assessment Requirements (SEARs) issued in May 2015 by the Department of Planning and Infrastructure (DP&I), the EP&A Act and Schedule 2 of the *Environmental Planning and Assessment Regulations 2000*.

Proposal objectives

The objectives of the Proposal are to:

- Provide landfill capacity to service the PMHC LGA up to approximately 2056
- Implement the strategies outlined in the PMHC Waste Strategy: 2017 – 2024, in particular, securing future capacity for waste disposal as an essential facility to complement current operational and future potential resource recovery options
- Receive, and dispose to landfill, general solid waste from within the PMHC LGA
- Excavate and extract clay and soft (shale) rock to provide landfill capacity and cover material requirements
- Operate the facility in accordance with the *Environmental Guidelines: Solid Waste Landfills, Second edition 2016* (New South Wales Environmental Protection Agency [NSW EPA], 2016) (the Guidelines).

[2] The 1999 EIS was developed by ERM to support the development application, and subsequent approval, for the first stage of the Cairncross landfill.

Proposal need and alternatives

Strategic need

The current approved area of the Cairncross Landfill, operated by PMHC, is nearing the end of its capacity and additional waste disposal capacity is required to service the needs of the LGA. The existing landfill (Stage E) is expected to reach capacity in approximately 2020. Therefore the Proposal is required to address the future waste disposal requirements of the PHMC LGA.

The Proposal seeks approval for three stages (rather than submitting separate applications in future for each additional stage) on the basis that:

- There is sufficient information available, and documented herein, to inform a full and thorough environmental assessment of these stages
- The three stages would be located adjacent to the existing landfill on appropriately zoned land
- PMHC has implemented numerous strategies that are contributing to achieving the NSW Waste Avoidance and Resource Recovery (WARR) targets for 2021–22 (WARR targets). The existing and future WARR targets have been taken into account when calculating landfill capacity requirements as part of the Proposal.
- Gaining approval for all three stages would:
  - Provide certainty for future waste disposal
  - Provide for long term planning on site for associated resource recovery activities
  - Save time and expense in reapplying for planning approvals as additional landfill space is required.

Alternatives

Do-nothing option

The do-nothing option is not feasible for a number of reasons; in particular, the option would fail to provide a suitable waste disposal facility for the ongoing needs of the PMHC LGA. The existing Cairncross Landfill is nearing its capacity and is expected to reach full capacity in approximately 2020.

The do-nothing option is not considered appropriate given the opportunity exists to provide increased waste disposal capacity at the Cairncross WMF, as was proposed and documented in the 1999 EIS.

Alternative sites

The location of the Stage E landfill was selected based on significant investigation into potential waste disposal locations within the PMHC LGA. A number of alternative sites to the Proposal Site were assessed including a site at Cowarra, which was initially selected as the preferred site. However, an EIS for the Cowarra site concluded not to proceed with that location due to significant environmental values present on the site and potential environmental impacts. Subsequent to this, an intensive site selection process was then undertaken to identify an alternate landfill site. 61 potential sites were identified and refined to 16 that would undergo on-site assessment. Of the 16 sites, four proceeded through detailed site assessment and were the subject of public consultation. The assessment process resulted in PMHC adopting the Cairncross WMF as the preferred site for waste disposal.

PMHC resolved to proceed with the preparation of an EIS for the proposed Cairncross WMF, including the Stage E landfill. The 1999 EIS documented the site selection process identified above and included provision for five landfill stages, with the first being for immediate implementation and the following four stages to be implemented progressively, as each cell reached capacity. Following submission of the EIS, the Proposal was granted approval under Part V of the EP&A Act on 26 July 1999.

The Proposal aims to provide the additional landfill capacity in the same geographical location identified in the 1999 EIS, however proposes that future landfilling is undertaken in three stages rather than the four stages previously proposed.

The site selection process undertaken in the 1999 EIS, and the resulting approval for the Cairncross WMF, support the suitability of the site for the Proposal.

Consultation

As part of an ongoing commitment to stakeholder engagement, PMHC has implemented a program of communication and consultation during the preparation of the EIS. PMHC has consulted with statutory agencies and stakeholders throughout the preparation of the EIS including:

- Department of Planning and Environment (DPE)
- Environmental Protection Authority (EPA)
- Office of Environment and Heritage (OEH)
- Department of Primary Industries (DPI)
- Roads and Maritime Services (RMS)
- National Parks and Wildlife Services (NPWS)
- The local community and stakeholders.

Key issues raised by statutory agencies and stakeholders included the need to ensure:

- The landfill cell design and construction meets the requirements and objectives of the NSW EPA Environmental Guidelines: Solid Waste Landfills – Second edition 2016 (NSW EPA 2016) (the Guidelines)
- Appropriate strategies are included in the design to mitigate against potential groundwater impacts
- Analysis of relevant interchanges is included in the traffic assessment with the results documented in the EIS
- That the safeguards proposed would mitigate potential impacts from the Proposal on the adjacent Rawdon Creek Nature Reserve.

These and other items raised during consultation have been addressed throughout this EIS.

Key environmental issues

Environmental investigations were undertaken during the preparation of the environmental assessment to identify the potential environmental impacts of the Proposal. Key environmental issues included biodiversity, soil, surface water quality, leachate, groundwater, Aboriginal heritage, traffic, greenhouse gas, hazards and risks. The findings presented below are based on the outcomes of specialist investigations/assessments for each of these issues.

Other potential environmental impacts assessed included strategic land use, air quality, noise and vibration, non-Aboriginal heritage, visual amenity, biosecurity, pests and vermin, socio-economic, ecologically sustainable development and cumulative

impacts. It was determined the Proposal would not significantly impact these environmental aspects.

Biodiversity

A *Biodiversity Assessment Report* (BAR) was prepared for the Proposal in accordance with OEH's *Framework for Biodiversity Assessment* (FBA) under the *NSW Biodiversity Offsets Policy for Major Projects* published in October 2014 (Appendix P of this EIS). The BAR identified one Plant Community Type (PCT) on the Development Site[3]: Blackbutt - Pink Bloodwood shrubby open forest of the coastal lowlands of the NSW North Coast Bioregion (NR117). This PCT is not associated with any threatened ecological communities listed under the *Threatened Species Conservation Act 1995* (TSC Act) or *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). A total of 3.4 hectares of this PCT would be cleared for the Proposal which would require offsetting with 221 ecosystem credits.

No threatened flora species were recorded on the Development Site. No threatened flora species listed under the TSC Act are considered likely to occur in the Development Site. One threatened flora species listed under the EPBC Act, *Cynanchum elegans* (White-flowered Wax Plant) was found to have a moderate likelihood of occurrence due to the presence of potential habitat across the Development Site. An Assessment of Significance was undertaken and found that impacts to 3.4 hectares of this species habitat would not be significant.

Three threatened fauna species listed under the TSC Act were recorded in the Development Site: Koala (*Phascolarctos cinereus*), Southern Myotis (*Myotis macropus*) and, tentatively, Green-thighed Frog (*Litoria brevipalmata*). The Development Site was found to support Koala feed trees, Southern Myotis and Green-thighed Frog habitat. Koala and Green-thighed Frog are 'species credit species' and impacts to 3.4 hectares of habitat require offsetting with 84 and 248 species credits, respectively. Southern Myotis is classed as both an ecosystem and species credit species; species credits only apply to areas of potential breeding habitat, which for this species is defined in the Threatened Species Profile Database (TSPD) as 'hollow-bearing trees, bridges, caves or artificial structures within 200 metres of riparian zone'. Impacts to 0.12 hectares of Southern Myotis breeding habitat would require offsetting with three species credits.

Two fauna species listed under the EPBC Act are known on the Development Site (Koala and Rufous Fantail (*Rhipidura rufifrons*)), two (Spotted-tail Quoll (*Dasyurus maculatus maculatus*)) and (Grey-headed Flying-fox (*Pteropus poliocephalus*)) are considered to have a high likelihood of occurrence, and one (Giant Barred Frog (*Mixophyes iteratus*)) is considered to have a moderate likelihood of occurrence. Assessments of Significance for all five species were undertaken which determined impacts would not be significant.

Additional biodiversity impacts include a loss of hollow-bearing trees and other fauna habitat, habitat fragmentation/loss of fauna habitat connectivity, impacts to groundwater dependent ecosystems (GDEs), fauna mortality, edge effects and weed invasion, alteration to air quality and noise levels and indirect impacts. Biodiversity-related impacts would be managed through the implementation of appropriate mitigation measures such as implementation of a hollow replacement program and two-stage clearing process, erosion and sediment controls and weed management. Offsets would be secured with the establishment of biobanking site(s).

[3] The Development Site comprises a 3.4 hectare area of native vegetation within the Proposal Site that is not already subject to approval for clearing

Soil

The large area of disturbance required at the site and timeframe for construction of the Proposal indicates there is a high potential for erosion from the Proposal Site, if not properly managed. Construction and operation of the Proposal would involve clearing of vegetation and significant earthmoving activities which will expose the soil and increase the risk of erosion and sedimentation. Likewise, the Proposal is expected to receive approximately 3.2 million tonnes of waste over the life of the landfill; this has the potential to generate leachate and presents a high risk of contamination if not properly managed.

The design of the Proposal has taken into consideration the high risk for potential soil erosion and contamination and includes best practice procedures in line with the Guidelines.

Following landfill closure, installation of the final landfill cap and establishment of the revegetation layer, the ongoing potential for soil impacts from the Proposal will be low.

Water quality

A hydrogeological assessment for the site was completed by Trace Environmental (*Hydrogeological Assessment - Cairncross Landfill Expansion*) (Hydrogeological Assessment) in October 2016. Arcadis reviewed this data, incorporating more recent groundwater monitoring data to establish the baseline data.

Sensitive receiving environments within the vicinity of the Proposal Site that could be affected by potential impacts to surface or groundwater include:

- Downstream waterways including Rawdon Creek and the Hastings River
- The Rawdon Creek Nature Reserve (managed by the NSW National Parks and Wildlife Service) and the Cairncross State Forest
- Potential GDEs
- Private groundwater bores.

The Proposal has the potential to result in impacts to surface and groundwater including changes to the local hydrology, site water balance, water quality and impacts to the surrounding sensitive receiving environments.

Surface water

The surface water management strategy forms an integral part of the Proposal and includes measures to prevent surface water being contaminated by leachate and prevent surface water infiltration into the landfill. Leachate will be captured separately from surface water, collected in tanks and pumped via rising main to a sewage treatment plant proposed to be built in 2018 adjacent to the Proposal Site. The STP does not form part of this Proposal however is being designed to be capable of accepting leachate from Stages 1-3 of the Proposal.

During construction and operation of the Proposal on-site detention basins will be used to capture and treat surface water runoff. The basins will be effective in events up to the 100 year ARI for Stages 1 and 3, and up to the 10 year ARI for Stage 2. Stage 2 post development velocities will increase by between 10 percent and 18 per cent, in a 20 year and 100 year ARI storm event, respectively. However, the sediment basin design is considered appropriate in terms of providing sediment control and on-site detention. Changes to the local hydrology have been further minimised as far as practicable while managing the need for erosion and sediment control on the site.

A water balance investigation has been undertaken for the Proposal which found that a water deficit is considered unlikely to occur except in extreme drought conditions, and could be mitigated by the ability to draw water from all on-site storage basins.

Potential water quality impacts are considered unlikely given that the Proposal has been designed to take into account the potential water quality risks including minimising erosion, managing sedimentation and avoiding leachate contamination of surface water.

Groundwater

Under most groundwater conditions the Proposal will have no impact on the local or regional groundwater system or the identified sensitive receiving environments. The most significant exceptions are in the southwest corner of Stage 1 and 2, and the southern part of Stage 1, where excavation would intercept groundwater should maximum groundwater levels occur. Under these circumstances, groundwater inflow into the base of the excavated area may occur at a low rate of 0.015 L/s. While groundwater inflows are expected to be very low, the predicted groundwater interception will need to be licenced, and volumes purchased on the market, in accordance with the Water Sharing Plan.

The resulting drawdown of the groundwater inflow into the base of the landfill is predicted to reach a maximum level of 0.1 meters, and extend to a maximum distance of approximately one kilometre from the Proposal Site. However, the identified groundwater users are more than one kilometre from the Proposal Site and no groundwater impact is predicted to occur at any of the identified bores.

No inflow is expected to occur into the landfill during the operational period following the installation of a drainage trench along the western boundary of Stage 1 and 2, and southern boundary of Stage 2. The drainage trench will divert groundwater from recharge areas to the south and east of Stage 1 and 2, and allow it to discharge via natural flow to the south.

Post closure of the landfill, the cells will be capped and rehabilitated, and the groundwater level is expected to remain as per pre-development levels an average of two meters below the cell floor.

Based on the above, it is considered unlikely that the Proposal will impact on groundwater quality.

Leachate

A core element of the Proposal is the leachate management strategy. If not managed appropriately, leachate has the potential to migrate outside of the lined landfill cell and result in soil, surface and groundwater contamination.

Leachate generation rates were assessed under five scenarios based on landfill staging across the current and future staging areas and at completion of filling. All scenarios considered leachate generation rates based on an average rainfall year, 90th percentile rainfall year and an average wet period. The scenarios considered the highest rate of leachate generation for each cell. The results demonstrate that the maximum monthly leachate generation will occur during Stage 3 of landfilling operations. Under this worst case scenario, an average of approximately 1,972 m^3/month of leachate would be generated during average rainfall year and approximately 2,280 m^3/month would be generated during a high rainfall year.

Leachate flow rates were calculated using a worst-case scenario from a high rainfall month. The results demonstrate the leachate flow rates will be 1,183.5 m^3/month and 1,097.4 m^3/month in Stage E, 1 and 2, and Stage 3, respectively.

The landfill has been designed to accommodate the predicted leachate volumes and flow rates. The leachate will be collected and transferred via a rising main to a sewage treatment plant proposed to be built in 2018 adjacent to the Proposal Site. The STP does not form part of this Proposal however is being designed to be capable of accepting leachate from Stages 1-3 of the Proposal.

As such, potential leachate impacts to soil, surface and groundwater are considered unlikely.

Traffic

A traffic assessment was undertaken to assess the impacts of the Proposal on the surrounding road network. The assessment used modelling scenarios to predict potential traffic changes and determined that there would be impacts on traffic flows, the road network and road safety as follows:

- The total number of two-way trips during the week is predicted to increase almost fourfold by 2056 (the final year of the Proposal), in comparison to the current year. The total number of two-way trips during the weekend is predicted to increase by 67 percent by 2056, in comparison to the current year
- There will be a relatively small increase in the number of trips at Blackmans Point Road and Haydon's Wharf interchange of nine and 13 percent in the year 2056, respectively
- There is a pre-existing potential safety risk of occasional vehicles cutting the corner when making right-hand turns out of the Cairncross WMF Access Road. Mitigation measures have been developed to address this potential road safety issue.

While vehicles movements are expected to increase up to almost fourfold in the final year of the Proposal, this increase is offset by the significant reduction in through-traffic associated with the realignment of the Pacific Highway. The transport network has therefore been identified as having sufficient capacity to cater for the additional traffic and is predicted to operate at a Level of Service A (LOS A), a condition of free, unrestricted flow for drivers and no upgrades to intersections are required.

Greenhouse gas

A greenhouse gas assessment was prepared to assess the predicted greenhouse gas impacts of the Proposal.

The Proposal would generate greenhouse gas (GHG) emissions from the use of machinery, vegetation clearing, transportation of waste, and waste decomposition. Overall GHG emissions from the Proposal, when considering all key emissions sources, are at their highest emitting point in 2057 and will total approximately 124,000 tonnes of carbon dioxide equivalents per annum (tCO_2-e/pa). This represents approximately 0.03 percent of Australia's total annual GHG emissions (as at 2017) and 0.1 percent of NSW's total emissions.

A number of mitigation measures will be implemented to minimise the generation of GHGs. These include project planning to minimise vehicle movements, implementation of a landfill gas monitoring program, and development of a landfill gas management plan.

Aboriginal heritage

A number of Aboriginal heritage assessments have been undertaken on the Proposal Site with the most recent conducted by Adise in 2016. The assessments determined two Aboriginal artefacts, albeit of limited archaeological potential and low scientific/archaeological significance, are expected to remain somewhere within the Proposal Site. It is anticipated that these sites will be destroyed during the construction of the Proposal. An Aboriginal Heritage Impact Permit (AHIP) under section 90 of the *National Parks and Wildlife Act 1974*, or an approval under Part 4 or an Excavation Permit under section 139 of the *Heritage Act 1977* is not required for SSD that is authorised by a development consent.

The assessments also determined the Proposal Site has been previously altered and has a lack of archaeological potential. The proposed mitigation measures focus on a procedure for the management of unexpected archaeological finds.

Hazards and risks

The results of the preliminary risk screening indicated that a preliminary hazard analysis (PHA) is not required, as all materials, including their transportation frequencies, do not exceed respective thresholds. Existing procedures are in place at the Stage E landfill for the safe handling, containment of spills and storage of chemicals on-site. These procedures will be extended to cover the Proposal and ensure that the Proposal does not result in any adverse impacts on the physical environment.

A bushfire assessment was conducted by Australian Bushfire Protection Planners (ABPP) who identified the Proposal Site as having a high bushfire risk as the adjoining forest vegetation has the potential to produce high intensity fires that could develop into crown fires. The Proposal includes a number of mitigation measures to ensure there is limited potential for increased occurrence or severity of bushfire on the Proposal Site or surrounds.

Other potential hazard and risks have been assessed, including:

- Fire and explosion caused by a number of factors including encroachment of bushfire, fires in waste, methane accumulation and ignition, or fires reaching the gas generator and gas flare infrastructure
- Liquid and solid spills may arise from situations such as potential loss of putrescible loads
- Health and respiratory impacts caused by vehicle exhaust, dust, microbial or gases/odours, and asbestos
- Safety of pedestrians and drivers at risk from vehicle movements on site.

The Proposal is considered to have minimal potential for impacts to human and environmental health with the application of the proposed mitigation measures.

Project justification and conclusion

In conclusion, the Proposal, has been subject to an EIS in accordance with the EP&A Act and the SEARs. The potential environmental, social and economic impacts, both direct and cumulative, have been identified and thoroughly assessed as part of this EIS. The assessment concluded that no significant environmental impacts are likely to occur as a result of the Proposal. It is considered that any potential impacts can be satisfactorily mitigated through a range of measures that have been identified within the EIS. In addition, the Proposal has been assessed against, and has been found to be consistent with, the priorities and targets adopted in relevant published and draft State plans, as well as Government policies and strategies.

Over the past two decades, PMHC have implemented a range of waste management initiatives that follow the waste hierarchy approach to waste management including:

- An integrated waste collection and kerbside recycling service
- Options to reduce the size/frequency of bins/collection services
- Development of recycling drop off centres
- Rollout of tailored education campaigns and promotion of household recycling activities
- Increased coverage of the compulsory domestic collection service for food and garden organics (FOGO)

- Separation and recycling of green waste, concrete and brick waste, e-waste, mattresses and tyres at waste depots.

Despite the aforementioned waste management strategies, there remains a need for additional landfill capacity to service the needs of the population in the future. The Proposal will provide significant benefit by providing additional landfill capacity that is required to meet the projected PMHC population and waste generation rates in an environmentally responsible way. Overall, the EIS concludes that the development proposed is in the public interest and approval is recommended.

1 INTRODUCTION

Port Macquarie-Hastings Council (PMHC) oversees the operation of the Cairncross Waste Management Facility (Cairncross WMF), which includes the operation of a landfill, Waste Transfer Station (WTS), an Organics Resource Recovery Facility (ORRF) and a Material Recovery Facility (MRF). The Cairncross WMF was granted approval under Part 4 and Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) for Stage 1 in 1999 (now referred to as the existing landfill or 'Stage E') and commenced operations in September 2001.

The Part 4 development approval (DA) for extractive industries for the Stage E landfill, DA No. 1999/178, was limited to 20 years. In February 2013, an extension of five years was sought on the original approval and was subsequently granted by PMHC. The current Part 4 approval is now due to conclude in 2026.

A Part 5 approval (REF 1999-002) was granted in 1999 for landfilling activities on the site, which was also limited to 20 years. A Review of Environmental Factors (REF) was prepared by PMHC in 2013 (the 2013 REF), to support an application for extension of the approved operational life of the Stage E landfill to 2026. The 2013 REF was approved by PMHC in October 2013.

Stage E is expected to reach capacity in approximately 2020. PMHC is now seeking approval for three new landfill stages from the Department of Planning and Environment (the Department) as State Significant Development (SSD) under Part 4, Division 4.1 of the EP&A Act. This Proposal aims to provide the additional landfill capacity in the same geographical location identified in the 1999 Environmental Impact Statement (EIS), however proposes that future landfilling is undertaken in three stages rather than the four stages previously proposed.

Council is committed to the reduction of waste being directed to landfill. It should be noted that the proposed landfill facility is not being considered in isolation of other waste management efforts being considered by Council, including organics and materials recovery through the ORRF and MRF at the Cairncross WMF which aim to further increase resource recovery rates and thus to reduce waste to landfill volumes in the future.

Arcadis has been engaged by PMHC to prepare this EIS for the Cairncross Landfill Expansion.

1.1 Proposal overview

PMHC proposes to expand the existing landfill (Cairncross Landfill) at the Cairncross WMF, located at 8395 Pacific Highway, Telegraph Point, NSW on Lot 1 / DP 1202080 (see Figure 1-1). PMHC is seeking development approval to extend Cairncross Landfill to cover the remaining area identified for landfilling in the EIS that was prepared by Environmental Resource Management (ERM) in 1999 to support the development application for the first stage of the landfill (the 1999 EIS).

The Proposal would involve the progressive construction, operation and rehabilitation of three landfill stages (Stages 1-3), following a staged approach with implementation over approximately 36 years. Stage 1 would commence construction/operation in approximately 2019/2020 respectively and Stage 3 would reach capacity in approximately 2056 with a landfill closure period to follow. Despite recent and expected future increases in diversion of waste to landfill, the annual waste acceptance rate would progressively increase over the life of the Proposal due to predicted population and waste generation growth per capita.

The Proposal Site is defined as the area shown on Figure 1-1 and is located south-west of Telegraph Point, approximately two kilometres west of the Pacific Highway. The Proposal Site covers an area of approximately 40.2 hectares (including the landfill and ancillary areas such as access roads and a biodiversity corridor) and is owned by PMHC. The Proposal Site is within the broader Cairncross WMF which is

bordered by the Rawdon Creek Nature Reserve to the south-east, by Cairncross State Forest to the north and south and by farmland to the west.

Approval is sought for the Proposal in the form of a Development Application (DA) under Part 4, Division 4.1 of the EP&A Act. PMHC submitted a request for the Director General's Requirements (DGRs) (now Secretary's Environmental Assessment Requirements (SEARs)) for the Proposal on 24 February 2015. The SEARs were subsequently issued on 7 May 2015 and are included at Appendix A (Reference SSD 13_5792). An extension to the SEARs was granted on 20 February 2017 (also included in Appendix A).

The Proposal will receive waste from all areas within the Port Macquarie-Hastings local government area (LGA) including the major townships of Port Macquarie, Wauchope and Camden Haven. Waste will include general solid waste (i.e. putrescible and non-putrescible materials) and asbestos from domestic and commercial and industrial (C&I) sources.

The key works for which approval is sought include:

- Progressive landfill cell construction, operation and rehabilitation of three landfill stages (Stages 1-3) including:
  - Clearing of 3.4 ha of existing vegetation
  - Construction of access tracks
  - Earthworks for cell formation including extraction and stockpiling of materials and the reapplication to form the leachate barrier (cell liner) as well as for daily, intermediate and final cover
  - Installation of leachate management structures including the leachate barrier, collection, storage and disposal system
  - Construction of a rising main to transfer leachate to the adjacent sewerage treatment plant (STP)[4]
  - Installation of a stormwater management system
  - Progressively increasing the annual waste acceptance rate at the landfill
  - Signage and other ancillary works
  - Rehabilitation of closed cells
- Delineation and ongoing management of an approximately 50 metre wide Koala connectivity corridor around the south-western border of the site.

The Proposal is expected to receive a total of approximately 3.2 million tonnes of waste over the life of the expanded landfill and would be developed in stages as described in Section 5. The Proposal stages are shown on Figure 1-2.

[4] The STP is proposed to be built in 2018 and is being designed to be capable of accepting leachate from Stages 1-3 of the Proposal.

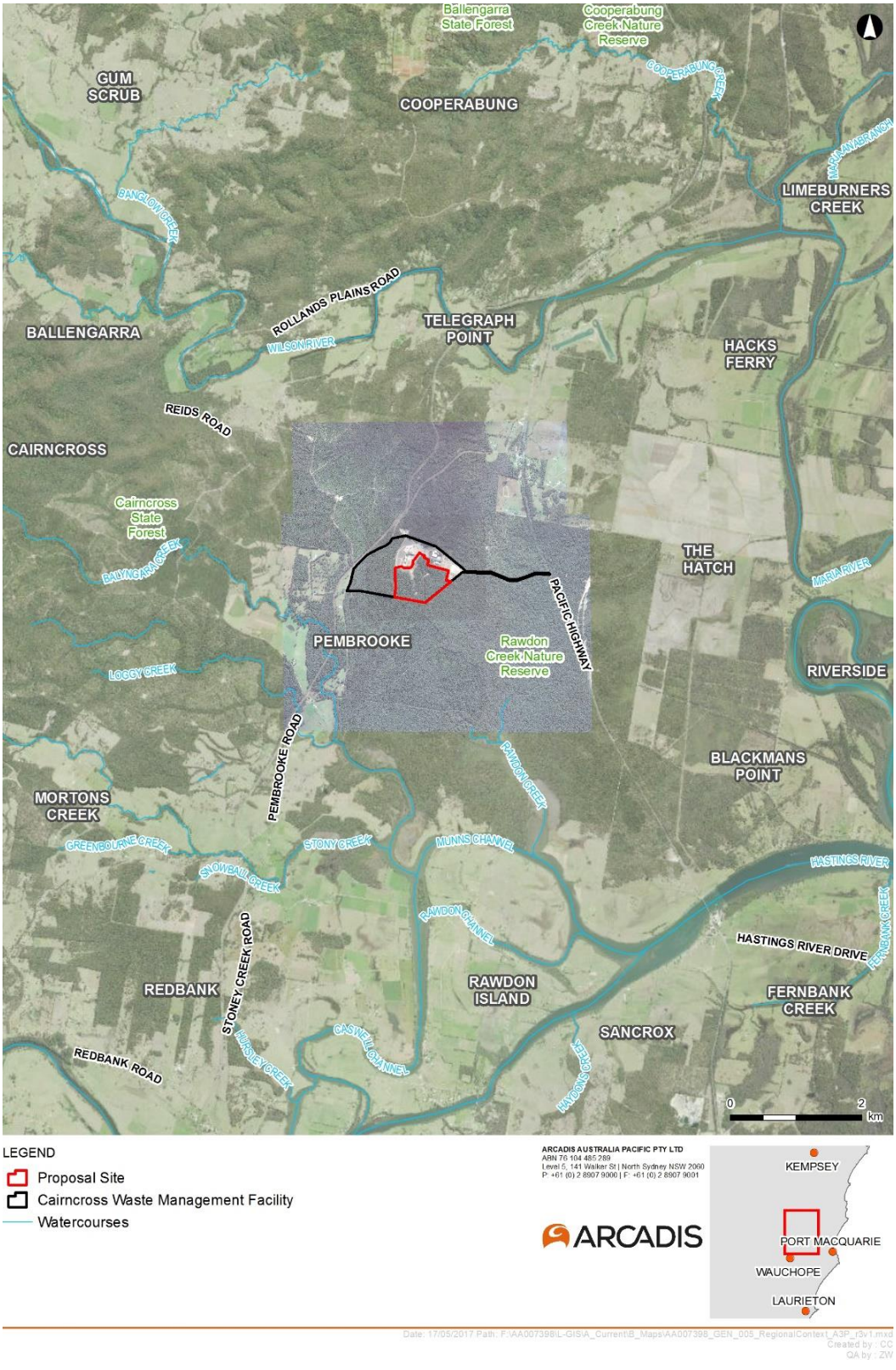


Figure 1-1 Site location

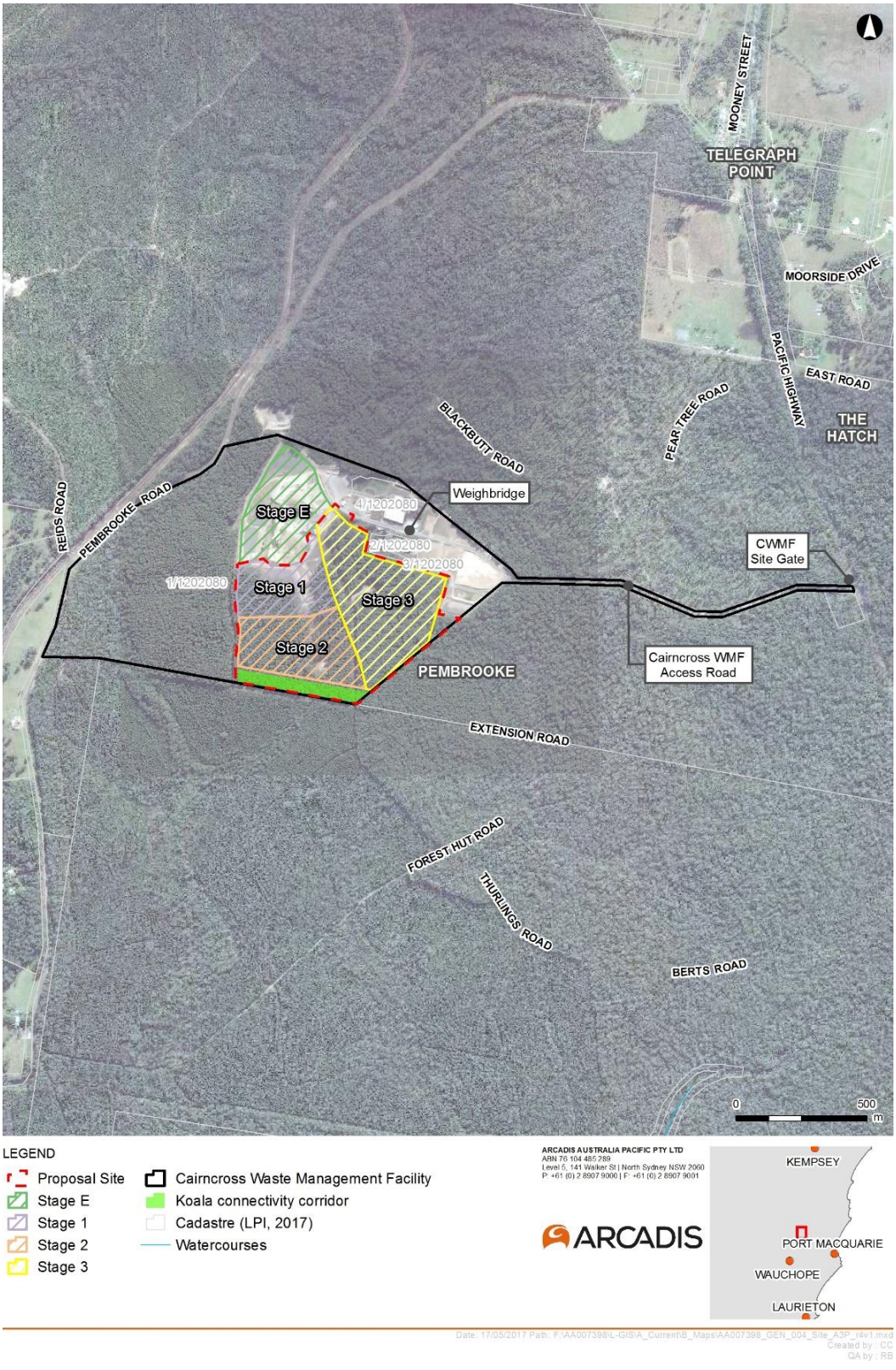


Figure 1-2 Site layout

The timeframes provided in Table 1-1 for each stage of the landfill are based on indicative waste generation modelling undertaken for the PMHC LGA. The start and end dates for each stage represent the likely timeframe for accepting waste, however the preparatory and completion works for each stage (e.g. landfill cell construction, construction of leachate barrier systems, and final rehabilitation) may commence/conclude up to two years before/after the timeframes provided below. The filling rates and landfill capacity would be reviewed on an ongoing basis.

Table 1-1 Details of landfill stages

Stage	Area (ha)	Capacity (t)	Timeframe[5]	Duration (years)	Activities
Stage 1	7.9	1,231,789	2020 – 2040	20	Progressive landfill cell construction, operation and rehabilitation.
Stage 2	10.4	777,779	2040 – 2047	7	
Stage 3	16.9	1,179,414	2047 – 2056	9	
Total	**45.4**	**3,188,982**	**2020 – 2056**	**36**	

The landfill is open every day throughout the year, with the exception of Good Friday, Sunday and Christmas Day, and would continue to operate during the following hours:

- Monday to Friday: 7am – 5pm
- Saturday, public holidays: 8am – 4pm.

Site management activities, such as covering operations, may continue one hour after closure. The concept design for the Proposal has been developed in accordance with the *Environmental Guidelines: Solid Waste Landfills*, *Second edition 2016* (NSW EPA, 2016) (the Guidelines). The *Cairncross Waste Management Facility: Concept Design Report* (PMHC, 2017) is provided in Appendix B.

1.2 Proposal objectives

The objectives of the Proposal are to:

- Provide landfill capacity to service the PMHC LGA up to approximately 2056
- Implement the strategies outlined in the Waste Strategy. In particular, securing future capacity for waste disposal as an essential facility to complement current operational and future potential resource recovery options.
- Receive, and dispose to landfill, general solid waste from within the PMHC LGA
- Excavate and extract clay and soft (shale) rock to provide landfill capacity and cover material requirements
- Operate the facility in accordance with the Guidelines.

The Proposal also aims to assist in meeting the NSW Waste Avoidance and Resource Recovery (WARR) targets for 2021–22 including:

- Increase recycling
- Divert more waste from landfill
- Manage problem wastes better
- Reduce litter

[5] Timeframes are approximate and subject to change (e.g. based on altered resource recovery and waste generation rates which would influence landfill life expectancy)

- Reduce illegal dumping.

1.3 Background to the Proposal

1.3.1 Stage E approval

An EIS was prepared in 1999 for the Cairncross WMF (1999 EIS) which largely focused on the development of the Cairncross Landfill and, in particular, what was then defined as 'Stage 1' (Stage E) of the landfill. Approval was granted for the landfill in 1999, under Part 4 of the EP&A Act and the landfill has been operating in accordance with:

- DA No. 1999/178, which permits extractive industries for the existing landfill area
- Part 5 Approval for landfilling within the existing landfill area, issued by PMHC in July 1999 and updated in 2013 (to cover landfilling to 2026)
- DA No. 2000/0582, which covers the operation of the gatehouse and weighbridge station, vehicular storage facility and the local transfer station within the Cairncross WMF
- Environmental Protection Licence (EPL) 11189
- Operational Environmental Management Plan (PMHC, 2008).

The proposed landfill would cover the expansion area identified within the 1999 EIS, hence this EIS has drawn on the studies undertaken for the 1999 EIS wherever relevant. These studies have been supplemented by additional investigations based on current guidelines and policies and the knowledge gained by PMHC in operating the existing landfill.

1.3.2 Recent waste initiatives

Over the past two decades, a range of initiatives have been implemented within the PMHC LGA to improve the waste management services within the region. The initiatives have seen the closure of a number of small satellite landfills (including the pending closure of the Dunbogan landfill) with the waste from this area being diverted to the Cairncross Landfill.

Other waste management strategies implemented within the LGA have included:

- The introduction of an integrated waste collection and kerbside recycling service
- Options to reduce the size/frequency of bins/collection services
- Development of recycling drop off centres
- Rollout of tailored education campaigns and promotion of household recycling activities
- Increased coverage of the compulsory domestic collection service for food and garden organics (FOGO)
- Separation and recycling of green waste, concrete and brick waste, e-waste, mattresses and tyres at waste depots.

These initiatives have significantly improved waste reduction, reuse and recovery rates within the PMHC LGA (see Sections 3.1 and 3.2 for more information).

Despite the suite of beneficial waste management strategies implemented in recent years, there remains a need for additional landfill capacity to service the needs of the population into the future (see Section 3.1 for need for the Proposal). This need was documented in the 1999 EIS (ERM Mitchell McCotter, 1999) which supported the development approval for the existing landfill. The 1999 EIS identified a total of five

landfill stages to be developed within the Cairncross WMF, the first of which is currently in operation and which is expected to reach capacity in approximately 2020.

Given the existing Stage E landfill is nearing its capacity, PMHC commissioned an assessment of the likely landfill disposal requirements of the region in order to determine the required capacity and most suitable planning horizon for the Proposal. The findings are documented in the *Cairncross Landfill Expansion: Future Disposal Capacity Requirements Report* (Disposal Requirements Report) (Arcadis, 2016) (Appendix C). Further detail regarding this assessment is provided in Section 3.2.1.

Modelling was undertaken on a range of scenarios, incorporating potential increases in waste generation, changes to diversion rates and the potential for the Cairncross WMF to accept tonnages from outside its LGA. The results show that the capacity of the existing Cairncross Landfill would be exhausted by approximately 2020 and that three additional cells are required to cater for PMHCs waste disposal requirements.

Most recently, PMHC adopted the Waste Strategy which outlines an overarching framework for ongoing operation and improvements to waste management over a 9-year period, from 2015–2024. The Waste Strategy builds on the 1999 EIS and the Disposal Requirements Report and recommends the expansion of the existing landfill at the Proposal Site to cater for the PMHC LGAs ongoing waste disposal requirements.

1.4 Structure of this EIS

This document is structured as follows:

- **Executive Summary:** Provides a brief overview of the Proposal, key environmental assessment results and an outline of the proposed mitigation measures
- **Chapter 1 - Introduction:** Provides an introduction to the Proposal and the EIS, including the objectives and background to the Proposal
- **Chapter 2 - Site Analysis:** Provides a summary description of the Proposal Site and surrounding land uses
- **Chapter 3 - Proposal Need and Alternatives:** Provides a discussion on the need for the Proposal including the strategic justification, relevant plans and policies and a description of alternatives to the Proposal
- **Chapter 4 - Consultation:** Provides a summary of the consultation (community, stakeholder and government agencies) which has been undertaken to date for the Proposal
- **Chapter 5 - Proposal Description:** Includes a description of the Proposal including a description of proposed works, built form, construction methodology and operational processes and procedures
- **Chapter 6 – Statutory Planning and Approvals:** Describes the statutory legislation and plans relevant to the Proposal at a Commonwealth, State and Local Government level
- **Chapter 7 - Environmental Risk Assessment:** Provides an analysis of the likely environmental risks and assigns a risk rating before and after the implementation of mitigation measures
- **Chapter 8 - Key Environmental Issues:** Provides a discussion on the existing environmental conditions and an assessment of the key environmental issues for the Proposal as identified in the SEARs as well as other environmental issues considered relevant to the Proposal
- **Chapter 9 – Other Environmental Issues:** Provides a discussion on the existing environment conditions and an assessment of the other environmental issues (not listed in the SEARs) for the Proposal, namely socio-economic.

- **Chapter 10 - Compilation of Mitigation Measures:** Includes a summary of the mitigation measures provided in Section 8 to minimise any adverse impact of the Proposal on the surrounding environment
- **Chapter 11 - Summary and Conclusion:** Provides a summary and conclusion of the Proposal
- **References:** Provides a list of the materials referenced throughout this EIS
- **Appendices:** Includes the SEARs and the specialist technical reports relied upon for the preparation of this EIS.

1.5 Secretary's Environmental Assessment Requirements: Reference Guide

The SEARs for the Proposal were issued on 7 May 2015 under section 78A(8A) of EP&A Act (SSD 13 5792) and an extension to the SEARs was granted on 20 February 2017 (Appendix A). Table 1-2 provides the full details of the SEARs and a reference to where they are addressed in this EIS.

Table 1-2 Secretary's Environmental Assessment Requirements: Reference Guide

Sub-heading	Details	Reference
General Requirements		
	The Environmental Impact Statement (EIS) for the development must meet the form and content requirements in Clauses 6 and 7 of Schedule 2 of the *Environmental Planning and Assessment Regulation 2000.*	All sections of this document
	THE EIS must also be accompanied by a report from a qualified quantity surveyor providing: • A detailed calculation of the capital investment value (as defined in clause 3 of the *Environmental Planning and Assessment Regulation 2000)* of the proposal, including details of all assumptions and components from the CIV calculation is derived; • A close estimate of the jobs that will be created by the development during the construction and operational phases of the development; and • Certification that the information provided is accurate at the date of preparation.	Section 1 and Appendix D
	The EIS must include the following: • A preliminary risk assessment is conducted in accordance with the State Environmental Planning Policy No 33 – Hazardous and Offensive Development; and • A detailed site history, including development consents	Section 8.13 Section 6.1
Key Issues		

Sub-heading	Details	Reference
Strategic Landuse Planning	• Demonstration that the proposal is generally consistent with the aims and objectives of all relevant environmental planning instruments and strategies and relevant Development Control Plans; • Justification for any inconsistency between the proposed development and these plans; • Consideration of the NSW government's investment in new technologies and infrastructure to drive recycling and reuse under the Waste Less, Recycle More Initiative; • Demonstration that the landfill construction and operation can be staged to ensure that the design remains current and in line with best practice at the time; • Details on the suitability of the site for the proposed development.	Section 2, 3.3 and 8.1
Waste Management	• Identification, classification and quantification of the likely waste streams that would be handled/stored/disposed of at the facility; • A description of how this waste would be treated, stored, used, disposed and handled on site, and transported to the site, and the potential impacts associated with these issues; • An analysis of whether the development is consistent with clause 123 of the Infrastructure SEPP; • A description of all reasonable and feasible measures that have been or would be implemented to maximise resource recovery from the waste stream and reduce the disposal of waste to landfill in line with the aims, objectives and guidance in the *NSW Waste avoidance and resource recovery strategy 2014-2021,* the EPA's *Guidelines for composting and related organics processing facilities,* council's adopted waste strategy, and other government policy; • Details of the landfill cell design and integrity in accordance with best practice industry standard guidelines such as the EPA's *Environmental guidelines: solid waste landfills;* • A description of the staged approach to developing the landfill so that the design and operation of future components can be reviewed in-line with future community's expectations and best practice; • Operational measures to manage litter and waste that is illegally dumped on adjacent properties including Rawdon Creek Nature Reserve.	Section 1.1, 3.2, 5.1 and 5.9 Section 5.9 Section 6.3 Section 3.3 Section 5 Section 5.1 Section 5.9
Flora and Fauna	• An assessment of the proposal under the Framework for Biodiversity Assessment (Oct 2014) including an assessment of any potential impacts on riparian vegetation and groundwater dependant ecosystems	Section 8.2

Sub-heading	Details	Reference
Soil, Water and Leachate	• The proposed erosion and sediment controls during construction and operation; • Consideration of potential acid sulfate soils, salinity, soil contamination; • A site water balance, including a detailed description of the measures to minimise the water use at the site; • A detailed assessment of the potential impacts of the project on the quantity, quality and long-term integrity of the surface and groundwater resources in the area, including baseline data of existing conditions, potential flooding impacts and potential impacts on Rawdon Creek; • The proposed stormwater management system, including the capacity of onsite detention systems, and measures to treat, reuse or dispose of water; • The proposed leachate management system including the capacity of the system to treat and dispose of leachate.	Sections 8.3, 8.4 and 8.5
Air Quality and Odour	• A quantitative assessment of the potential air quality and odour impacts of the development on surrounding receivers, including impacts from construction, operation and transport; • Details of the proposed mitigation, management and monitoring measures.	Section 8.6
Noise and Vibration	• Quantitative assessment of potential construction, operational and transport noise and vibration impacts, including potential impacts on nearby sensitive receivers; • Details of the proposed noise management and monitoring measures.	Section 8.7
Traffic	• Details of all traffic types and volumes likely to be generated; • Assessment of predicted impacts on road safety and the capacity of the road network to accommodate the project; • Assessment of where off site infrastructure works are required as a result of traffic impacts.	Section 8.8
Greenhouse Gas	• A quantitative assessment of the scope 1, 2 and 3 greenhouse gas emissions of the project; • A detailed description of the measures that would be implemented to minimise the methane emissions of the proposed landfill operations and ensure that the project is energy efficient.	Section 8.9
Rehabilitation	• A detailed description of how the site would be progressively rehabilitated, revegetated, and integrated into the surrounding landscape, including	Section 5.10

Sub-heading	Details	Reference
	measures to ensure that the final landform is free draining; • Justification for the proposed final landform and use, taking into consideration any relevant strategic land use planning or resource management plans or policies; • A detailed description of the measures that would be put in place to ensure sufficient resources are available to implement the proposed rehabilitation measures, and the ongoing management of the site following the cessation of landfilling activities.	
Heritage	• Both Aboriginal and non-Aboriginal;	Section 8.10 and 8.11
Visual impacts	• Visual impacts;	Section 8.12
Hazards and risks	• Hazards and risks; and	Section 8.13
Biosecurity, pests and vermin	• Biosecurity, pests and vermin.	Section 8.2
Plans and Documents		
Plans and Documents	The EIS must include all relevant plans, architectural drawings, diagrams and relevant documentation required under Schedule 1 of the *Environmental Planning and Assessment Regulation 2000.* These documents should be included as part of the EIS rather than as separate documents.	All sections of this document, particularly Section 5
Consultation		
Consultation	During the preparation of the EIS, you must consult with the relevant local, State or Commonwealth Government authorities, service providers, community groups and affected landowners. In particular, you must consult with: • Environment Protection Authority; • Office of Environment and Heritage; • Department of Primary Industries; • Roads and Maritime Services; and • The local community and stakeholders. The EIS must describe the consultation process and the issues raised, and identify where the design of the development has been amended in response to these issues. Where amendments have not been made to address an issue, a short explanation should be provided.	Section 4

Sub-heading	Details	Reference
Further Consultation after 2 years	If you do not lodge an EIS for the development within 2 years of the issue date of these DGRs, you must consult with the Director-General in relation to the requirements for lodgement.	Section 4
References	The assessment of the key issues listed above must take into account relevant guidelines, policies, and plans as identified. While not exhaustive, Attachment 1 contains a list of some of the guidelines, policies, and plans that may be relevant to the environmental assessment of this development.	All sections of this document

2 SITE DESCRIPTION

The Proposal Site is located approximately five kilometres south-west of Telegraph Point and approximately 15 kilometres north-west of Port Macquarie. The site is within the Cairncross WMF, approximately two kilometres west of the Pacific Highway (see Figure 2-1).

The Proposal Site covers an area of approximately 40.2 hectares and is owned by the PMHC. The proposed site layout is shown in Figure 1-2 and Figure 2-1. The Proposal Site includes the area proposed for the three landfill cells (Stages 1-3) as well as an area to be designated as an approximately 50 metre Koala connectivity corridor. The Proposal Site is located at the top of a shallow valley feature extending south from a low east-west ridge passing along the northern part of the site.

The site is managed by PMHC and is classed as operational land. The site is within Lot 1 / DP 1202080, 8395 Pacific Highway, Telegraph Point. The site is zoned "SP2 Waste or Resource Management Facility" under *Port Macquarie-Hastings Local Environment Plan 2011* (PMHC LEP) as shown on the land zoning map in Figure 2-2.

Approximately 36 hectares of the Proposal Site is currently vegetated. An *Authorisation for timber plantation* (Department of Infrastructure, Planning and Natural Resources (DIPNR), 2004) applies to 32.6 hectares of this area and the primary vegetation consists of Blackbutt Plantation which is permitted to be progressively cleared for the purposes of expansion of the landfill under approval GR0412P (26 October 2004), upon written notification to the DIPNR on a biennial basis. The remaining 3.4 hectares consists of native vegetation mapped as Blackbutt Grassy Forest, which would be cleared as part of the Proposal. Biodiversity offsets would be secured with the establishment of biobanking site(s).

The suitability of the site for landfilling was established prior to and during preparation of the 1999 EIS. The area for landfilling was chosen for the following reasons:

- The site is located at the head of a shallow valley feature extending south from a low east-west ridge passing along the northern part of the site. Therefore, there is no surface water draining onto the site from areas above the landfill
- The landfill area is contained within a low ridge feature which provides natural boundaries for the landfill. The Proposal Site is well buffered from sensitive receivers, with the nearest residential properties located approximately 1.3 kilometres to the north-east and more than 0.8 kilometres to the south-west of the Proposal Site
- The landfill is contained within a single valley feature and therefore does not impact on other drainage catchments
- The contours of the site and the extent of the area available to be retained as natural buffers ensure that the site will not be visible from any area outside the site
- The site includes natural clay and shale which is suitable for use on the Proposal
- The site is located above flood liable land.

Since commencement of operation of the site as a landfill in 2000, PMHC have not received any complaints from the community, including the closest residential receivers, in relation to operation of the landfill and no non-compliances have been recorded against operational performance requirements. The broader community's acceptance of the landfill (see further detail in Chapter 4) and compliance with environmental performance requirements indicates that the siting of the landfill is suitable, providing an adequate buffer from all sensitive environmental receivers.

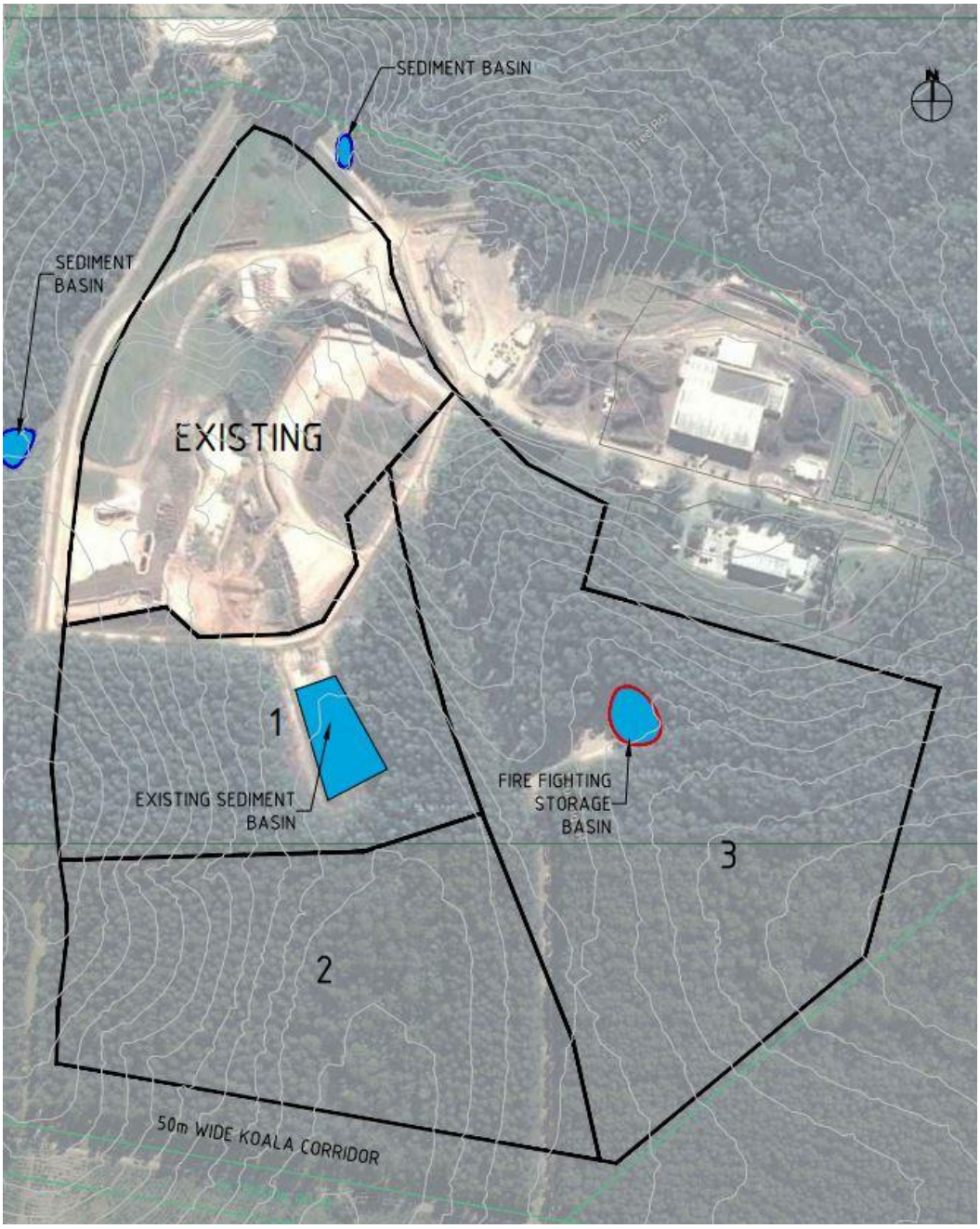


Figure 2-1 Site layout (details)

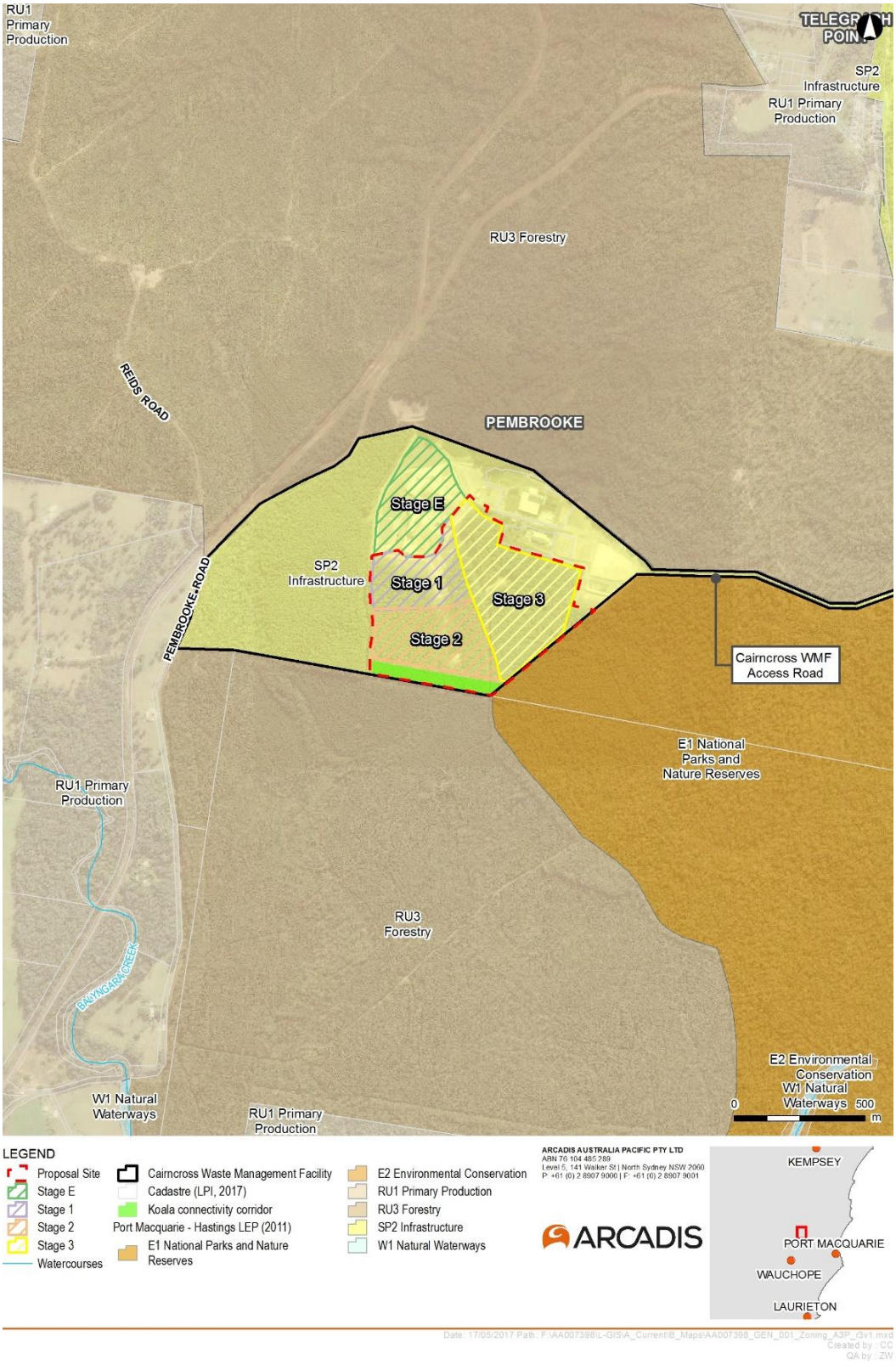


Figure 2-2 Land zoning

2.1 Surrounding land uses

The land uses surrounding the Proposal Site can be ascertained through reference to the site layout map (Figure 1-2) and the land zoning map (Figure 2-2). The nearest residential properties are located approximately 1.3 kilometres to the north-east and more than 0.8 kilometres to the south-west of the Proposal Site.

To the north-east of the Proposal Site lies the ORRF and MRF (which form part of the broader Cairncross WMF) and an Industrial Precinct is currently being developed to the east of the site. The land use and activities undertaken and/or proposed in the vicinity of the Cairncross WMF are described in further detail in Section 2.2.

Cairncross State Forest borders the Proposal Site to the north and south, with the Rawdon Creek Nature Reserve located to the south-east. The western edge of the Proposal Site is bordered by land zoned SP2 Infrastructure (Waste and Resource Management Facility) which contains a compensatory habitat area that was established as part of the Cairncross WMF. To the west of the compensatory habitat area is Pembrooke Road, beyond which is agricultural land zoned for Primary Production (RU1).

2.2 Existing landfill

The existing Stage E landfill cell has a total landfill volume of approximately 1,436,000 metres^3 and is expected to be completed in 2019.

The earthworks materials balance and landfill volume for Stage E is detailed in Table 2-1.

Table 2-1 Materials balance summary for Stage E landfill

Description	Quantity
Area (m^2)	102,063
Topsoil stripping volume (m^3)[6]	30,619
Clay excavation volume (m^3)	554,362
Leachate barrier clay volume (m^3)	91,857
Cap clay volume (m^3)	81,650
Vegetation layer topsoil volume (m^3)	30,619
Landfill void volume (m^3)	1,435,997
Day cover clay required (m^3) (10% of void)[7]	143,600
Actual landfill void volume (m^3) (less day cover volume)	1,292,397
Total clay required (m^3)	317,107
Clay balance (m^3) (-ve = deficit)	237,255

[6] Assumes 300 mm depth of topsoil

[7] Based on actual measured volumes within Stage E needed to achieve 150 mm daily cover

The excavation of sub-cells is undertaken progressively with excavated clay stockpiled for future use as cell liner, day cover, intermediate cover and final capping material.

Waste is placed in layers and compacted. The *Cairncross Waste Management Facility Landfill Environment Management Plan (2001)* (Connell Wagner, 2001) and the *Operational Environmental Management Plan: Cairncross Waste Management Facility* (PMHC, 2008) (OEMP) detailed a landfill compaction density of 850 kilogram/metre^3 for the site. Field testing indicates that this level of compaction has been achieved in completed landfill cells.

The capping layer for Stage E comprises a 600 millimetre compacted clay layer which is topped by a 500 millimetre topsoil layer. The compacted clay is to have a permeability of less than $1x10^{-8}$ m/s.

The existing landfill stage commenced in the north of the site and is progressing south. Stage E is due for completion in 2019.

2.3 Broader Cairncross waste management facility

The Cairncross WMF was constructed to replace the existing Port Macquarie landfill which was closed in 2001. The facility was opened in 2001 and includes a receival area, including weighbridge, office and staff amenities, an ORRF, MRF and WTS. Details regarding the applicable approvals for these facilities are provided in Section 6.

Recyclable material and green waste is transferred from the Port Macquarie Waste Management Facility as well as from the Wauchope, Camden Haven and Comboyne waste transfer stations.

Receival and storage facilities are also provided for materials not able to be landfilled for which processing and reuse alternatives are available. Other facilities include waste processing and recovery area, vehicular storage facility, water supply dam and site infrastructure.

The OEMP (PMHC, 2008) applies to the Cairncross WMF and would be updated to cover the Proposal and to reflect the requirements resulting from this EIS. In this regard, it is noted that the areas designated for the ORRF, MRF and WTS have entirely separate stormwater management systems and the ORRF and MRF are operated under contracts by external parties. Day to day management of these facilities would remain separate from management of the Proposal Site. For example, vehicles carrying materials unsuitable for the ORRF would be directed back to the weighbridge and then onto the appropriate disposal location (e.g. landfill) within the Cairncross WMF.

The layout of the Cairncross WMF is shown on Figure 2-3.

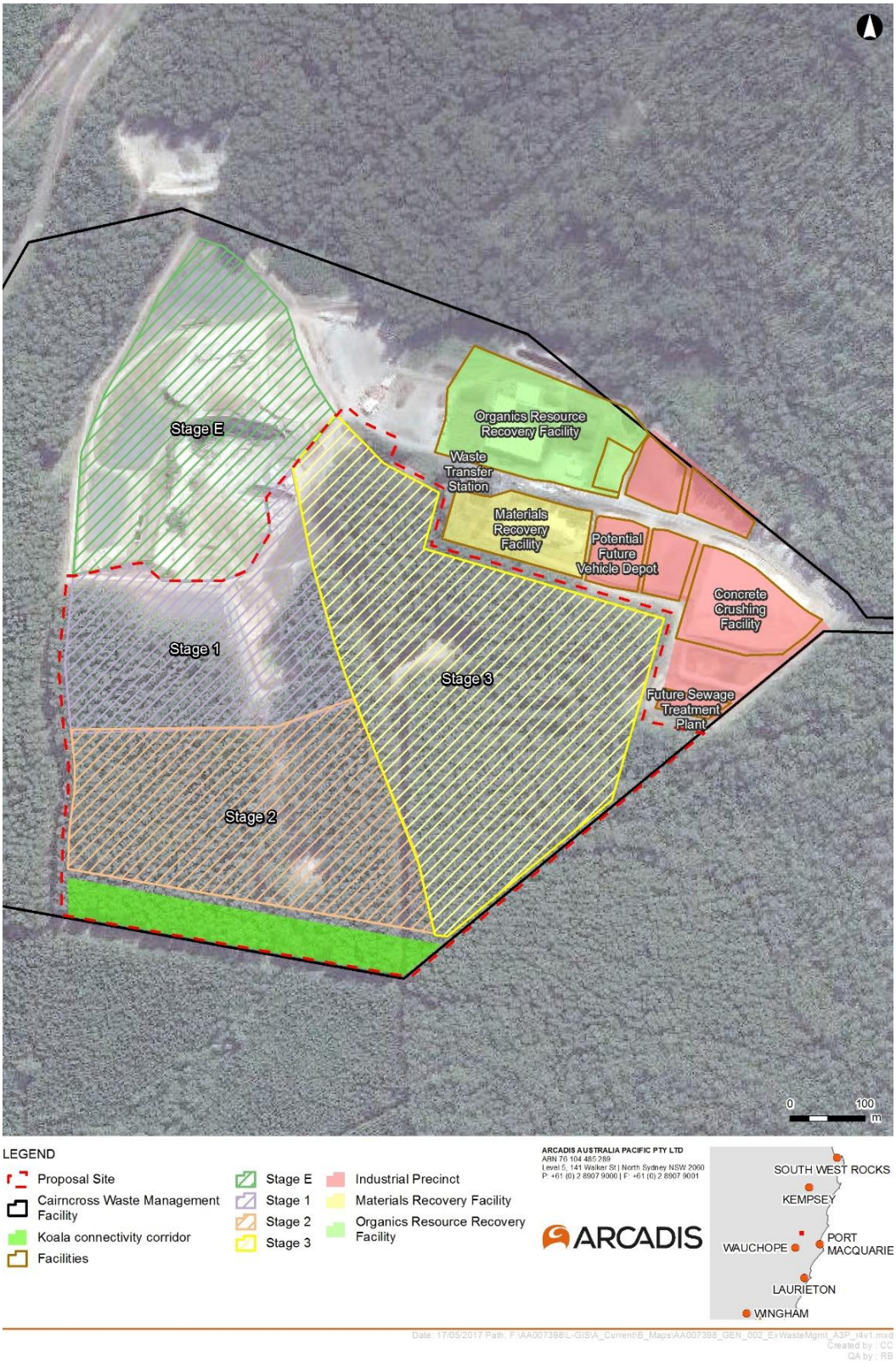


Figure 2-3 Existing waste management facilities

2.3.1 Organics resource recovery facility

An ORRF (for domestic and commercial wastes) is present at the Cairncross WMF and is operated by a contractor engaged by PMHC. The ORRF receives organic material from PMHC's domestic kerbside collections and other waste facilities (described in Section 2.5). This material is mulched and incorporated with bio-solids received from Council's sewage treatment plant. The material is then composted in sealed concrete tunnels and, after completion of the compositing process (approximately 27 days), the composted material is screened through a rotary trommel. Reject material screened out is reintroduced into the composting process to allow for complete decomposition. Screened compost is stockpiled pending removal to markets.

The composting is on hard stand areas with appropriate irrigation and drainage facilities. Runoff is directed to a leachate collection pond from which water is irrigated onto the composting tunnels to maintain optimum moisture levels. Excess water is extracted to sewer.

The compost derived from this process has significant value in agricultural, horticultural and landscaping applications.

2.3.2 Materials recovery facility

A MRF is also located within the boundary of the Cairncross WMF and is operated by a contractor engaged by PMHC. The MRF processes all the recyclable material collected as part of the domestic collection service. Recyclables include; newsprint; cardboard (except waxed cardboard); paper and paper products; glass; PET plastics; aluminium; steel and aerosol cans; HDPE (e.g. two litre milk bottles); and liquid paperboard (e.g. milk and juice cartons).

Material is sourced from PMHC domestic collection, PMHC transfer stations, Kempsey Shire Council domestic collection, Kempsey Shire Council's transfer stations, and private companies offering commercial recycling collection services.

Material is processed using manual sorting, trommels, conveyor systems, magnets, vacuum and air separator systems, balers etc.

Rejected material not suitable for processing is disposed of in the Cairncross Landfill. Current rejection/contamination rate is nine percent (i.e. 91 percent recovery) (Kerbside Recycling Audit Port Macquarie-Hastings and Kempsey Shire Local Government Areas, January 2016).

Processed material is sold to organisations such as Visy, Amcor, Polytrade, Impact Recycling and GRS Glass Recovery.

2.3.3 Waste transfer station

The WTS is provided for local domestic use and has areas for storage of small quantities of tyres, chemicals, batteries and oil. The WTS receives waste from local domestic traffic thereby avoiding the need for this traffic to access the active landfill face. General waste from bins is then transferred from the transfer station to the tipping face by collection contractors. Tyres, chemicals, batteries and oil are removed from site by specialised contractors.

2.3.4 Concrete crushing trial

A two year concrete crushing trial commenced on the Cairncross WMF in February 2016 to determine the viability of an ongoing concrete and masonry processing facility.

Source separated material including rock, concrete, masonry and clay derived materials are directed to the processing area.

Stockpiled material is processed through a mobile crushing plant and screened into various product grades. Water is irrigated over the crushing and screening operations to control dust where necessary.

Processed material is stored on-site pending internal use on roads or drainage structures or alternatively removed for external use.

Should the trial be successful, PMHC will develop a more permanent concrete crushing facility.

2.4 Industrial precinct

An Industrial Precinct is currently being developed at the eastern edge of the Cairncross WMF (Development Approval # 2013/659). The site will cover approximately 7.5 hectares and will ultimately incorporate the Telegraph Point Sewage Treatment Plant (STP), waste collection vehicle depot, concrete crushing facility, gas bottle recycling, mattress recycling, e-waste storage, building material recovery and storage. Operation of the site is expected to commence in mid-2018.

Leachate from the Proposal would be transferred to the STP in line with the updated OEMP to be prepared for the Proposal Site. The layout of the industrial precinct is shown on Figure 2-3.

2.4.1 Waste collection vehicle depot

The current domestic waste collection contract assumed that the waste collection contractor would construct and occupy a new depot at Cairncross. However, the contractor has now moved to a new depot in the Port Macquarie industrial area and there is no need for a depot at Cairncross. As such the proposed depot, will not proceed under the current contract.

However, council will maintain the vacant site and offer it as part of the next collection contract in 2024 for use as a vehicle depot. Should a future contractor wish to proceed with this offer it is likely a depot may be operational from 2025-26.

2.5 Other PMHC waste management facilities

In addition to the facilities that operate at the Cairncross WMF, PMHC has a range of other operational waste facilities. These facilities include:

- Port Macquarie (Kingfisher Road) Waste Management Facility including closed landfill, transfer station, aqueous liquid trade waste plant, concrete and masonry recovery (to close in May 2017) and other associated works
- Dunbogan Landfill closed in June 2017 and the Kew Transfer Station commenced operation
- Wauchope Transfer Station and the closed Wauchope Landfill
- Comboyne Transfer Station – limited operation.

2.6 Built form at Cairncross WMF

2.6.1 Existing site access

Access to the Proposal Site was established during development of the Cairncross WMF in the form of a sealed, two lane, all weather Access Road which connects to the Pacific Highway approximately two kilometres to the east. The landfill area is

accessed via gravel roads/tracks from the site work shed, which are maintained to an all-weather two-wheel drive vehicle standard.

The existing Access Road includes a turning circle provided immediately inside the access handle property boundary and a lockable gate at the site entrance. Access to the Proposal Site would continue to be along the private Access Road.

NSW Roads and Maritime Services (RMS) are upgrading the Pacific Highway from Oxley Highway to Kempsey. The upgrade will realign the Pacific Highway to the east of its current location, meaning that the existing Pacific Highway connecting to the Access Road will become a Local Council road and will carry significantly fewer vehicles than the current traffic volumes.

No upgrades are required to the Access Road or the intersection with the existing Pacific Highway as a result of the Proposal.

2.6.2 Office, amenities and weighbridge

An office, amenities and weighbridge exist within the broader Cairncross WMF and are approved under DA No. 2000/0582, outside of the Proposal Site. No such infrastructure is required to be developed as part of the Proposal. The OEMP currently outlines procedures and requirements for the weighbridge, which largely align with the requirements of the *Protection of the Environment Operations (Waste) Regulation 2014* (POEO Waste Regulation). Further information on the operation of the weighbridge, in regards to appropriate monitoring and recording of waste, is provided in Section 5.9.3.

2.6.3 Workshop, wheel-wash and wash down bay

A workshop, wheel-wash and wash down bay (approved under DA No. 2002/0582) are located outside the Proposal Site and would be available for use by landfill traffic. However, no modifications to these facilities are required and these facilities fall outside the scope of the Proposal.

2.6.4 Parking

Parking is provided at the weighbridge and at workshop areas for staff and customers. No additional parking is required as part of the Proposal.

2.6.5 Hazardous materials storage

Small volumes of hazardous paints and chemicals are stored on the Cairncross WMF site (but outside of the Proposal Site). These materials are removed by hazardous waste contractors (e.g. Toxfree, Transpacific, DrumMuster).

Asbestos is received and disposed of to landfill in accordance with PMHC's Standard Operating Procedure (SOP) 2. The management of asbestos is described in Section 5.9.5.

2.6.6 Fencing

Chain wire fencing is currently installed around the Stage E landfill and will be progressively extended around the Proposal Site as new landfill stages become active.

3 PROPOSAL NEED AND ALTERNATIVES

3.1 Need and strategic justification

PMHC operates a licensed landfill site at the Cairncross WMF. The current approved area of the Cairncross Landfill is nearing the end of its capacity and additional waste disposal capacity is required to service the needs of the LGA. The existing landfill is expected to reach capacity in approximately 2020.

A modern, well-managed engineered landfill provides an important service to the community by handling its waste in a cost-effective, environmentally responsible way. PMHC have made significant advances in diverting waste from landfill through establishing recycling programs and infrastructure projects such as organics resource recovery and materials resource recovery facilities. Nevertheless, a need for landfill infrastructure will remain into the foreseeable future. For certain wastes, there is no current or foreseeable reuse, treatment or recycling option.

This Proposal seeks approval for three stages on the basis that:

- There is sufficient information available, and documented herein, to inform a full and thorough environmental assessment of these stages
- PMHC has implemented numerous strategies that are contributing to achieving the WARR targets (see Section 3.2) and the predicted landfill capacity requirements have taken the existing and future predicted WARR targets into account. Strategies either implemented or currently planned which have/will contribute to WARR targets include:
  - Closing Dunbogan landfill and opening a transfer station at Kew, thus increasing diversion. The Dunbogan landfill is 95 percent capped with expected completion late-2017. The Kew waste transfer station commenced operation in mid-2017
  - Implementation of a fortnightly domestic collection service in 2014 which is increasing diversions
  - A Public Place recycling assessment was undertaken in 2015
  - Installation of public place recycling bins in Port Macquarie and Wauchope
  - Increased focus on food and organics via rollout of kitchen food bins in 2014
  - A C&I education campaign is to be implemented in 2018
  - A commercial food waste feasibility assessment is to be undertaken in 2018
  - Undertaking School, Multi-Unit Dwellings and Holiday accommodation recycling campaigns commenced in 2016 across the LGA.
- The three stages would be located adjacent to the existing landfill on appropriately zoned land (zoned “SP2 Waste or Resource Management Facility” under the PMHC LEP)
- Gaining approval for all three stages (rather than submitting separate applications in future for each additional stage) would:
  - Provide certainty for future waste disposal
  - Provide for long term planning on site for associated resource recovery activities
  - Save time and expense in reapplying for planning approvals as additional landfill space is required.

Council recognises the importance of improving environmental standards for landfill design and management. A review of waste management performance would be undertaken prior to construction of each new stage. A report would be provided to

DPE 12 months prior to construction of each new landfill stage outlining the results of the review and providing justification for the additional landfill space.

3.2 Meeting diversion targets

PMHC has made significant progress in recent years in improving waste diversion rates throughout the LGA and moving towards achievement of the NSW WARR waste diversion target of 70 percent diversion.

Specific achievements have been reported in the Waste Strategy and include:

- **Residential waste and resource recovery:** PMHC now offers residential and commercial waste collection services and garbage bins, comingled recycling bins and FOGO bins. PMHC also provide transfer stations and community recycling centres (CRCs) which enable safe disposal/recovery of other materials such as bulky goods, scrap metal, e-waste, sharps and household hazardous waste (HHW).
- **Resident kerbside collection system:** PMHC provides residents a number of bin sizes / pick up frequency options for the collection of garbage (140 litre or 240 litre), recyclables (240 litre) and FOGO (240 litre bin). Recyclables and garbage are collected on alternating fortnights and FOGO is collected weekly. Garbage can be collected weekly at an extra charge. PMHC also provides a kitchen food waste caddy and starch liners for inside the home to encourage the use of the FOGO system.
- **Kerbside diversion rates:** MRA (2016) identified that the kerbside recovery rate within PMHC LGA is approximately 58 percent. This represents a significant improvement and indicates PMHCs progress towards reaching both the regional waste diversion target (of 60 percent) and NSW WARR diversion target (of 70 percent).
- **Residential waste generation trends**: the initiatives implemented throughout the LGA in recent years have had a noticeable impact on waste trends as evidenced by the following findings reported by MRA (2016):
  - *"Total tonnes of waste collected from households has decreased by 1% since 2011 [despite an increase in population];*
  - *Collected garbage has deceased;*
  - *Organic waste has increased since 2011 due to the inclusion of food organics; and*
  - *Comingled recycling collected has remained relatively steady*" (MRA, 2016).

The increasing landfill diversion rate is presented in Figure 3-1.

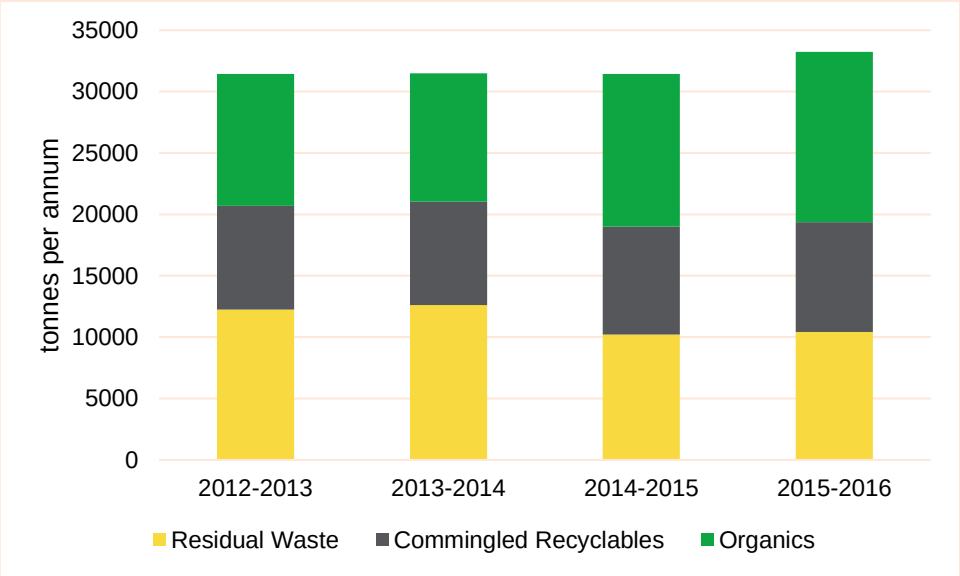


Figure 3-1 Kerbside waste generation (MRA, 2016)

3.2.1 **Future disposal capacity requirements**

PMHC commissioned an assessment of the future waste disposal capacity requirements of the region in order to provide strategic justification for the landfill expansion including, in particular, the long-term nature of the planning horizon involved in the Proposal (i.e. 39 year lifespan, including Stage E).

The assessment is documented in the Disposal Requirements Report (Arcadis, 2016) and is provided in full in Appendix C. The report presents the modelling results and assumptions, and identifies:

- The likely waste generation/diversion rates (and therefore filling rates for the proposed landfill stages)
- An assessment of an alternative scenario should the Proposal not proceed
- An outline of the appropriate planning horizon for subsequent expansion of the Cairncross Landfill based on the modelling analysis.

Five waste diversion scenarios were modelled (see Appendix C), each with three different waste generation growth rates applied (low, moderate, high). The scenario identified as the most realistic for adoption in strategic waste planning was 'Scenario 4'[8] with a moderate waste generation growth rate applied. This was considered a conservative yet realistic scenario.

Table 3-1 identifies the estimated volume and tonnage capacity of the three proposed landfill stages considered within the assessment and is based on Scenario 4.

[8] Where the LGA achieves a 75% kerbside diversion rate by 2015-16; a 40% diversion rate for C&I by 2021-22; and no change to commercial and domestic (C&D) / other MSW diversion rates.

Table 3-1 Estimated volume, tonnage capacity and completion year of proposed landfill stages at Cairncross WMF[9]

Stage	Estimated volume (m^3)	Estimated volume ex. allowance for daily cover	Estimated tonnage capacity (t)	Estimated completion year
1	1,610,181	1,449,163	1,231,789	2040
2	1,016,705	915,035	777,779	2047
3	1,541,718	1,387,546	1,179,414	2056
TOTAL	**4,168,604**	**3,751,744**	**3,188,982**	**NA**

Based on the tonnages in Table 3-1 and the waste generation and diversion rates modelled under Scenario 4, it is estimated that the three landfill stages would be complete in the following years:

- Stage 1: 2040
- Stage 2: 2047
- Stage 3: 2056.

The landfilling filling rates and landfill cell lifespan is represented graphically in Figure 3-2.

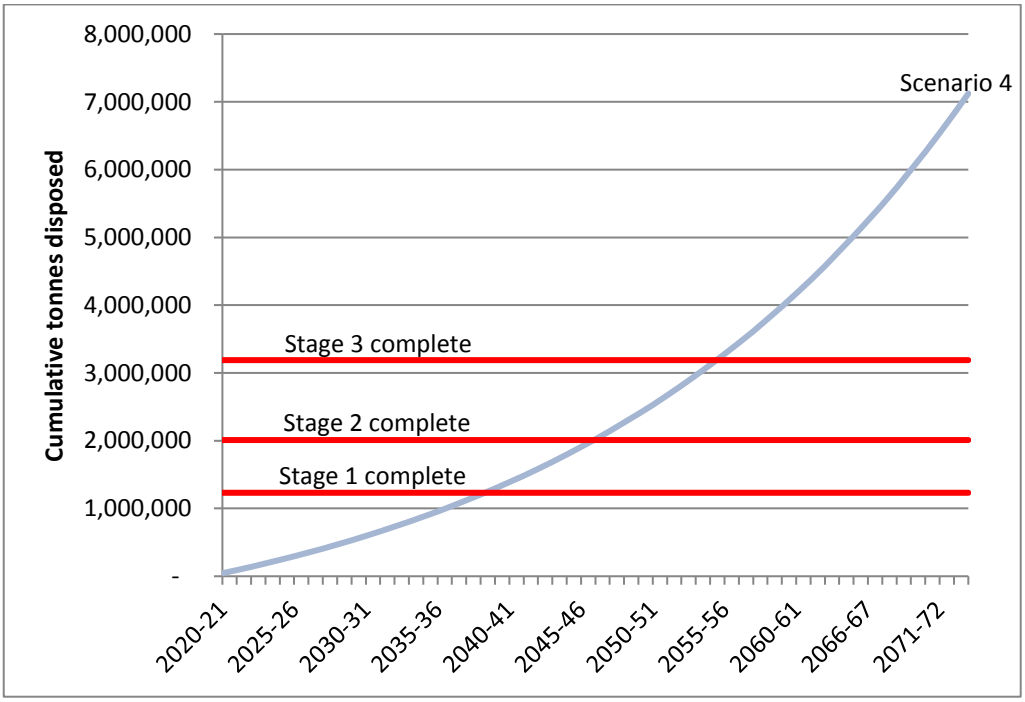


Figure 3-2 Landfill filling rates and landfill lifespan for the Proposal

The primary waste streams for waste disposed are 'residential' and 'commercial and industrial' (52 percent and 40 percent respectively). Other 'municipal solid waste' and 'construction and demolition' waste streams represent three percent and five percent of the total waste disposed respectively.

[9] Estimated volumes and stages provided by PMHC. Estimated tonnage capacity utilises a compaction rate of 850 kg/m^3, sourced from the site's *Operational Environmental Management Plan 2008*.

Figure 3-2 demonstrates the need for an expansion of the existing landfill to cater for the needs of the PMHC LGA.

The assessment also considered waste disposal options outside of the PMHC LGA should the Proposal not proceed. The findings of that investigation are included in further detail in Section 3.4. In summary, disposal of waste outside the LGA is not considered a viable option for social, environmental and economic reasons.

Based on this assessment, the expansion of the Cairncross Landfill is considered the necessary and responsible solution to PMHC's waste disposal needs. The Proposal is needed to address the ongoing waste disposal requirements of the PHMC LGA and expansion of the existing landfill provides a significant opportunity to utilise a well-managed and proven waste disposal location that has adjacent associated waste diversion facilities, thereby providing a logical and coordinated waste disposal solution for the LGA.

3.3 Strategic planning policies

As required by the SEARs, relevant aims, objective and guidance from PMHC's adopted Waste Strategy and other relevant government policies are summarised in this section. The EPA's *Guidelines for Composting and Related Organics Processing Facilities* was referenced in the SEARs. However, it has been excluded as it's not relevant to the Proposal.

3.3.1 PMHC waste strategy: 2017-2024

The Waste Strategy outlines a strategic direction for all of PMHC's waste and resource management activities. It includes a range of projects, initiatives and actions and has been developed to align with the NSW WARR Strategy: 2014 - 2021 and the Midwaste Regional WARR Strategy: 2014-– 2021. The Waste Strategy also compliments Council's planning and reporting frameworks to ensure linkages with operational and delivery plans (MRA, 2016).

The Waste Strategy aims to:

- Encourage safe, cost effective, innovative and convenient waste services
- Encourage adoption of the best available waste management technologies/delivery methods
- Ensure consistency with PMHC's policies and Community Strategic Plan.

The Waste Strategy acknowledges the success of a single landfill and central waste and resource management hub at the Cairncross WMF and calls for certainty with respect to "the long term planning and delivery of Council's future waste asset and infrastructure needs" (MRA, 2016).

The Proposal is one of the key actions in the Waste Strategy: to secure a long-term planning approval for the expansion of the Cairncross Landfill to ensure ongoing capacity for the disposal of residual municipal solid waste (MSW), construction and demolition (C&D) and C&I waste (MRA, 2016).

3.3.2 National waste policy: less waste, more resources

The National Waste Policy: Less Waste, More Resources was released in November 2009 and outlines the Federal government's direction for waste management in Australia through to 2020. The outcomes intended to be achieved under the Policy include the following:

- Australia manages waste, including hazardous waste, in an environmentally safe, scientific and sound manner, and has reduced the amount per capita of waste disposed

- Waste streams are routinely managed as a resource to achieve better environmental, social and economic outcomes
- Australia has increased the amount of products, goods and materials that can be readily and safely used for other purposes at end of life.

The Proposal will assist the implementation of these outcomes by providing best practice landfill design, construction, operation and management. The Proposal will operate as one component of PMHCs broader waste management services which include a number of waste avoidance and minimisation strategies. The expansion of the landfill will complement the adjacent ORRF and MRF and provide a safe and reliable location for disposal of waste. The Proposal is therefore consistent with the aims and objectives of the National Waste Policy.

3.3.3 NSW 2021: Goal 23

NSW 2021: A Plan to Make NSW Number 1 (NSW 2021 State Plan) (NSW Government, 2013) is the NSW Government's ten-year plan to guide development and economic growth within NSW. NSW 2021 establishes 32 goals, of which Goal 23 is identified by the SEARs as being applicable to the Proposal:

- Goal 23 - Increase opportunities for people to look after their own neighbourhoods and environments.

Specific targets within Goal 23 that are relevant to the Proposal include:

- NSW achieving the lowest litter count per capita in Australia
- Increase recycling to meet the 2014 NSW WARR targets.

Overall, the Proposal has been designed to improve the efficiency, usability and environmental performance of waste management in the PMHC LGA and this will result in benefits to the community, the commercial sector and the environment.

Operation of the Proposal will encourage, and aim to prevent, the escape of litter from vehicles transporting waste to the Proposal Site. Operational procedures for the site will incorporate litter reduction and collection procedures both within the site itself and on the local access road. Vehicles entering the site will continue to be inspected for potentially recoverable materials that can be diverted from landfill for reuse. The management of the landfill, in coordination with the adjacent waste management facilities (including the ORRF and MRF), will support an increase in recycling that will contribute to meeting the WARR targets.

3.3.4 NSW waste avoidance and resource recovery strategy 2014-2021

The NSW Waste Avoidance and Resource Recovery Strategy 2014-21 (WARR Strategy) (NSW EPA, 2014) is established under the *Waste Avoidance and Resource Recovery Act 2001* (WARR Act) and is the principal tool used to achieve the objects of the WARR Act. The key result areas of the WARR Strategy are as follows:

- 1) Avoid and reduce waste generation
- 2) Increase recycling
- 3) Divert more waste from landfill
- 4) Manage problem wastes better
- 5) Reduce litter
- 6) Reduce illegal dumping.

The WARR Strategy has named the following targets, to be achieved by 2021–22:

- Avoiding and reducing the amount of waste generated per person in NSW
- Increasing recycling rates to:
  - 70 percent for municipal solid waste
  - 70 percent for C&I waste
  - 80 percent for C&D waste
- Increasing waste diverted from landfill to 75 percent
- Managing problem wastes better, establishing 86 drop-off facilities and services across NSW
- Reducing litter, with 40 percent fewer items (compared to 2012) by 2017
- Combatting illegal dumping, with 30 percent fewer incidents (compared to 2011) by 2017.

The Proposal will contribute to the key result areas two to six through the provision of a best practice landfill with operational procedures that support the diversion of unacceptable or reusable materials from the landfill. This will support an increase in recycling and diversion of waste from landfill by providing a facility that allows for improved separation of waste streams and diversion of recoverable materials to the adjacent ORRF and MRF. As discussed in Section 5.9.11, preventing illegal dumping on the access road, and reducing litter (both within the site and adjacent areas), will be a key focus of the OEMP governing the Proposal.

Landfill diversion targets established in the WARR Strategy are financially incentivised through the waste levy, which is an instrument implemented through the *Protection of the Environment Operations Act 1997* (POEO Act). The waste levy requires certain licensed waste facilities in NSW to pay a contribution for each tonne of waste received at the facility. The waste levy applies in the regulated area of NSW which comprises the Sydney metropolitan area, the Illawarra and Hunter regions, the central and north coast local government areas to the Queensland border as well as the Blue Mountains, Wingecarribee and Wollondilly local government areas. As a result of this policy, waste avoidance, resource recovery and alternate waste treatment are financially incentivised through avoided levy.

3.3.5 **Draft North Coast Regional Plan**

The Draft North Coast Regional Plan (the Plan) “outlines a vision, goals and actions that focus on a sustainable future for the region as it grows that protects the environment, builds a prosperous community and offers attractive lifestyle choices for residents” (DPE, 2016).

Key goals of the Plan include ensuring a natural environment, and Aboriginal and historic heritage, that is protected, and landscapes that are productive. The design of the Proposal has considered a range of potential environmental impacts, including Aboriginal and non-Aboriginal heritage, and has avoided or mitigated these impacts as far as feasible and reasonable.

The Plan also considers the need for separation of waste facilities from urban developments, a requirement that was considered in the original site selection for the Cairncross WMF and which will be complied with as part of the Proposal.

3.4 Alternatives

This section describes the alternatives considered by PMHC when investigating options for the ongoing management of waste in the PMHC LGA. The section is structured under the following broad headings: the 'do-nothing' option, alternative sites for development of a landfill, disposal of waste outside of the PMHC LGA, shared facilities and consideration of on-site alternatives and/or technologies.

3.4.1 Do-nothing option

The investigation of alternatives included consideration of a 'do-nothing' option. This option is not feasible for a number of reasons, in particular because it would fail to provide a suitable waste disposal facility for the ongoing needs of the PMHC LGA. As discussed above, the existing Cairncross Landfill is nearing its capacity and is expected to reach full capacity in 2020-2021.

The do-nothing option is not considered appropriate given the opportunity exists to provide increased waste disposal capacity at the Cairncross WMF as was proposed and documented in the 1999 EIS.

3.4.2 Alternative sites

The location for the current Cairncross Landfill site was selected based on significant investigation into potential waste disposal locations within the LGA.

Investigations into potentially suitable sites commenced following the development of the 1991 Waste Disposal Strategy Study (Patterson Britton and Partners, 1991). The study identified the need to find a new landfill site to replace the Port Macquarie landfill which, at that time, was estimated to have a further four years' capacity. The study also recommended the closure of all nine landfills operating at the time of the report, following the construction of a new landfill.

Following the 1991 study, a site selection process was undertaken and was documented in the Hastings Regional Waste Disposal Facility Site Selection Study (Patterson Britton and Partners, 1994). The study identified a site off Houston Mitchell Drive, Cowarra as a preferred site.

An EIS for the Cowarra site was completed in 1995 (Patterson Britton and Partners, 1995). Council, in January 1996, resolved not to proceed with that proposal due to significant environmental values and likely impacts identified on the site.

An intensive site selection process was then undertaken to identify an alternate landfill site involving:

- Desktop analysis of the entire LGA to identify potentially suitable sites
- Substantial community consultation
- Identification of 61 potential sites which was refined to a list of 16 sites that would undergo on-site assessment
- Detailed site assessments of the 16 sites in terms of flora and fauna values, engineering, geotechnical and landfill management. This process reduced the 16 potential sites to four.
- The four short listed sites were subjected to detailed site investigations including archaeological investigations
- Further public consultation was undertaken on the four sites
- The Council then adopted site 10, now the location of the Cairncross WMF, as the preferred site.

PMHC resolved to proceed with the preparation of an EIS for the proposed Cairncross WMF. The 1999 EIS documented the site selection process identified above and included provision for five landfill stages, with the first being for immediate implementation and the following four stages to be implemented progressively as each cell reached capacity. Following submission of the EIS, the Proposal was granted approval under Part V of the EP&A ACT on 26 July 1999.

This Proposal aims to provide the additional landfill capacity in the same geographical location identified in the 1999 EIS however proposes that future landfilling is undertaken in three stages rather than the four stages previously proposed.

The site selection process undertaken in the 1999 EIS, and the resulting approval for the Cairncross WMF, support the suitability of the site for the Proposal. Further information about the Proposal Site's characteristics and suitability are included in Chapter 2 and Section 8.1.

3.4.3 **Disposal outside of the PMHC LGA**

The Disposal Requirements Report (Appendix C) considered waste disposal options outside of the PMHC LGA should the Proposal not proceed. The assessment identified that some of the likely impacts of this scenario upon PMHC would include:

- The need for the development of a transfer facility at the Cairncross WMF, through which residual waste could be compacted and then transferred to a facility outside the PMHC LGA
- Loss of income associated with the landfill operations
- Increased gate fees to the PMHC community due to waste transfer costs
- Heightened risk of maintaining a local avenue for management of residual waste, due to reliance on other councils and the transport network.

The assessment identified that there are a number of landfills in the region which may be able to accept waste from PMHC LGA. Greater Taree and Kempsey are the closest LGAs to Port Macquarie and therefore represent the likeliest options to accept PMHC's waste, should a commercial arrangement be made with one of those councils.

A high-level cost estimate was undertaken to demonstrate the additional costs to PMHC associated with not receiving approval for subsequent landfill stages. The costs considered were indicative only, and are subject to development of concept and detailed design, technology and transportation options available in 2020-21, and the commercial arrangement made with the alternative disposal facility.

The cost impact of not having future disposal capacity at Cairncross WMF would be a significant liability to PMHC, with initial capital costs of around $3-6 million and then ongoing transfer costs of at least $1.8 million per year. It is also likely that PMHC would face additional disposal costs at an alternative landfill in comparison to the cost of operating Cairncross WMF. By comparison, the capital investment value (CIV) and operational costs of the Proposal are estimated to be $57 million (excluding GST) (see Section 1 and Appendix D for more information on the CIV).

This option is not considered a suitable alternative to cater for the waste disposal needs within the PMHC LGA.

3.4.4 **Shared facilities**

Prior to undertaking the site selection study for the 1999 EIS, both Greater Taree City Council and Kempsey Shire Council were contacted to determine the possibility of shared facilities. Both Councils advised that they currently have adequate landfill capacity into the foreseeable future at existing sites and consequently were not interested in a joint proposal.

The potential for the Proposal to cater for waste from other LGAs was analysed as part of the Disposal Requirements Report. The report considered waste contributions from other LGAs when generating potential landfill filling rates under various scenarios. The current Proposal is based on filling rates that exclude contributions from other LGAs as they have generally been found to either have sufficient capacity for their own needs into the mid-term or are located at too great a distance from the Proposal site to make transfer arrangements economically viable.

3.4.5 Consideration of alternative technologies

The original ORRF developed at the Cairncross WMF in 2001 was one of the early Alternate Waste Technologies (AWT) implemented in Australia and was designed in two parts. One area was designed to process organic waste into high quality compost, and the other area was designed to stabilise mixed solid waste prior to landfilling.

The organic area of the facility has been very successful, processing over 20,000 tonnes of domestic and commercial garden and food organics, woody waste and treated bio-solids annually into compost. Organic processing is ongoing and will continue in the future.

The mixed solid waste area was not as successful and the facility was discontinued in 2011 due to limited success and high costs.

A trial of separating C&I waste was commenced in 2011, however this also had limited resource separation success and was discontinued.

In November 2012, PMHC advertised an AWT Contract Expression of Interest (EOI-12-07) for consideration of best practice technologies to process the mixed solid waste stream and provide more positive results in terms of diversion from landfill. The EOI also considered:

- Linking a gas (methane) extraction and power generation system to the landfill
- Linking a package STP system to the process
- Further inclusion of C&I and domestic waste streams
- Carbon Price Mechanism (CPM) and future Carbon Emissions Trading Scheme (ETS).

The EOI submissions indicated PMHC would likely receive limited and costly proposals. The submissions also highlighted the unproven technology of many AWTs including uncertainties such as actual landfill diversion rates, cost to ratepayers, environmental levy exemptions etc.

In addition, with the introduction of the fortnightly red bin collection service, it was likely the composition of the MSW stream would alter making current AWT technologies and costs more uncertain. Other issues such as the infancy of the NSW waste to energy policy, the drop in the current European carbon price (approx. 3 euro/tonnes) and scrapping of the carbon price mechanism and ETS were also considered.

It is on this basis that PMHC agreed not to proceed with an AWT until more is known about the altered MSW stream, waste to energy policy direction, levy exemptions and costs.

4 CONSULTATION

This section summarises the community and stakeholder engagement activities and feedback received during the preparation of this EIS. This section also provides details on proposed stakeholder engagement activities which are to be undertaken during the public exhibition of this EIS.

Extensive consultation was undertaken when initially selecting the location of the landfill in 1999. This consultation is discussed in detail in Section 1.3 of the 1999 EIS.

4.1 Consultation requirements

The SEARs for the Proposal outline the requirements for consultation which should be undertaken during preparation of the EIS. The SEARs require that consultation should be undertaken with the following parties:

- Department of Planning and Environment (DPE)
- Environmental Protection Authority (EPA)
- Office of Environment and Heritage (OEH)
- Department of Primary Industries (DPI)
- Roads and Maritime Services (RMS)
- National Parks and Wildlife Services (NPWS)
- The local community and stakeholders.

A description of the consultation undertaken in accordance with the SEARs, including consultation undertaken with the community, stakeholders and government agencies, is provided in further detail below.

4.2 Consultation objectives

The objectives of the community and consultation activities were to:

- Raise awareness of the Proposal in the local community, providing information about the Proposal development and approval process
- Ensure a transparent and accountable community involvement process for the Proposal
- Document community input for consideration in the EIS and at the conclusion of the consultation process
- Manage community expectations by clearly outlining the decision making process and how their feedback would be used
- Engage with relevant government stakeholders to confirm issues relevant to the Proposal.

4.3 Government agency consultation

Consultation with government agencies was carried out to identify potential issues that should be addressed. A summary of responses raised in government agency consultation, and where each is addressed in the EIS, is provided in Table 4-1.

Table 4-1 Summary of key issues raised by government agencies

Agency/ Stakeholder	Consultation details	Response/Issue	EIS Section where addressed
Department of Planning (DoP, now DPE)	PMHC wrote to DoP requesting DGRs for the Proposal on 17 September 2012.	DGRs were issued on 14 February 2013. The DGRs were amended and reissued as SEARs by DPE in 2015.	All sections of this EIS. See SEARs reference guide in Section 1.5.
	PMHC wrote to DPE on 31 January 2017, requesting an extension of SEARs	DPE extended the SEARs for an additional six months.	
DPE & EPA	A meeting was held on 18 March 2015 with PMHC, DPE and EPA to discuss the Proposal.	DPE requested that consideration be given to the duration of any new planning approvals (i.e. the expected landfill life).	Landfill life expectancy has been reduced since initial discussions with DPE, supported by detailed waste forecasting, and is discussed in Chapter 1 and Section 3.2.1.
		The EPA noted the requirement for the landfill cell design and construction to meet the *Draft Environmental Guidelines: Solid waste landfills, Second edition, 2015* (EPA 2015). New guidelines were subsequently issued in 2016 and have been addressed throughout this EIS.	The Proposal has been designed in accordance with the Guidelines. All sections of this EIS, particularly Chapter 5 and in the Concept Design Report (Appendix B).
DPE	PMHC requested an amendment to the DGRs on 17 February 2015.	DPE responded with SEARs on 7 May 2015. All items raised by DPE in the SEARs are addressed in this EIS.	All Sections of this EIS. See SEARs reference guide in Section 1.5.
	PMHC requested an extension of time to the SEARs on 31 January 2017.	DPE responded with an extension of time to November 2017 on 17 February 2017.	
	PMHC wrote to DPE in December 2016 providing an update on the progress of the Proposal since their previous correspondence, including revisions	DPE responded requesting additional details be provided on concept design figures.	Concept Design Report (Appendix B)

Agency/ Stakeholder	Consultation details	Response/Issue	EIS Section where addressed
	to design and reduced landfill life expectancy.		
EPA	A meeting was held with EPA on 6 May 2016 to present and discuss the specifics of the landfill design.	PMHC noted the design had been developed in accordance with the *Environmental Guidelines, Solid waste landfills Second edition, 2016* (EPA 2016). EPA confirmed suitability of the adopted two metre clearance from the average groundwater level and the proposed trench to divert above-average groundwater levels.	Chapter 5 and the Concept Design Report (Appendix B).
	PMHC wrote to the EPA in December 2016 providing an update on the progress of the Proposal since their previous consultation, including revisions to design and reduced landfill life expectancy.	EPA responded requesting additional details be provided on concept design figures.	All figures within the EIS.
RMS	PMHC wrote to RMS in July 2016 regarding the site access and scope of the traffic assessment.	RMS advised that analysis of relevant interchanges be included in any traffic impact assessment with the results documented in the EIS.	Traffic Impact Assessment (Appendix B) and Section 8.8.
OEH	PMHC wrote to OEH in December 2016 regarding the Heritage and Biodiversity Assessment Reports.	OEH responded on 22 February 2017 noting no further requirement under NSW legislation for assessment of biodiversity impacts (for the approved plantation forest clearing) however suggested PMHC consider any assessment requirements under the EPBC Act.	Biodiversity Assessment Report (Appendix P) and Section 8.2
		OEH – NSW National Parks and Wildlife Service responded on 8 March 2017 expressing their interest in the sediment basin and sewage plant along the shared boundary between NPWS and the Proposal, particularly in	Sections 8.2, 8.3 8.4 and 8.5

Agency/ Stakeholder	Consultation details	Response/Issue	EIS Section where addressed
		the safeguards proposed to mitigate the impacts of these features on the reserve.	
	PMHC wrote to OEH in July 2017 seeking clarification on securing offset land timing.	OEH wrote to PMHC on 18 September 2017 regarding the offset requirements for the Proposal and the timeframe for securing offsets.	Section 8.2.4
DPI	PMHC wrote to DPI (Water) in December 2016 highlighting the findings from the Hydrogeological Report and requesting advice regarding a water access licence under the Water Management Act (2000)	No reply	NA
PMHC	The project management team for the landfill expansion met with PMHCs internal planning team during development of this EIS to provide updates on the concept design and seek feedback on any matters to be incorporated in the EIS.	No issues raised	NA
NPWS	PMHC wrote to the NPWS in December 2016 regarding the Proposal and enclosing Concept Design Drawings.	No reply	NA

4.4 Aboriginal heritage consultation

Adise undertook an Aboriginal and non-Aboriginal cultural heritage assessment for the Proposal during development of this EIS, including consultation with the local Aboriginal community in accordance with the requirements of the DECCW (2010) *Aboriginal Cultural Heritage Consultation Requirements for Proponents*.

Letters inviting registration of interest in the Proposal were mailed to the following potential knowledge-holder organisations identified by the OEH:

- Birpai Local Aboriginal Land Council (Birpai LALC)

- Saltwater Tribal Council
- Ghinni Ghinni Youth and Cultural Aboriginal Corporation
- Bindi Aboriginal Heritage and Cultural Centre Inc.
- Sunrise Guiwan Birpi Elders Corporation
- Lakkari NTCG.

In addition, a newspaper notice was published in the local print media inviting registrations of interest from Aboriginal parties with cultural knowledge of the Proposal Site.

The Dunghutti Elders Council Aboriginal Corporation (Dunghutti Elders) and Birpai LALC both registered an interest in the Proposal and became registered Aboriginal parties (RAPs) for ongoing consultation. The Aboriginal consultation process proceeded with the participation the Birpai LALC and Dunghutti Elders.

Letters providing details of the Proposal and the purpose, scope and draft methodology for the cultural heritage assessment, were sent to the two RAPs requesting review and advice. No amendments of the methodology were requested.

A site investigation was undertaken with representatives from the RAPs in order to record Aboriginal objects and Potential Archaeological Deposits (PADs). No Aboriginal objects or PADs were recorded during the site visit.

The draft Aboriginal and non-Aboriginal cultural heritage assessment report was sent to the RAPs for review and comment. Neither party required amendment of the report which was subsequently finalised in December 2016 and is attached in Appendix E.

4.5 Community consultation

As previously mentioned, extensive consultation was undertaken for the 1999 EIS (ERM, 1999). Community consultation included the following:

- Public meetings at which potential landfill sites were presented
- Public advertisements inviting submissions on suitable landfill site options
- Exhibition of an economic and social benefit analysis of waste management
- Establishment of a Waste Options Working Party consisting of Councillors and a representative of the Cairncross Tip Action Group
- A public meeting to allow discussion on the hydrogeological and geotechnical investigation.

Community consultation for the Proposal will be incorporated into the exhibition of the updated Waste Strategy (scheduled for 2017).

PMHC contacted the Secretary of the Cairncross Tip Action Group in April 2015 to enquire about their interest in the landfill expansion. While the group has now disbanded, the former Secretary noted that they had no issues with the existing landfill and no further interest in the proposed expansion.

PMHC contacted the Telegraph Point Community Association (TPCA) when the Waste Strategy was exhibited (mid 2017) to highlight the proposed landfill expansion. No comment or feedback was recieved.

Ongoing consultation with the community will occur through public exhibition of the EIS, as required under clause 79(1) of the EP&A Act and Division 5 of the *Environmental Planning and Assessment Regulation 2000* (EP&A Regs). This will include exhibition of the EIS for a period of not less than 30 days.

5 PROPOSAL DESCRIPTION

This section provides a detailed description of the design of the Proposal, the proposed landfill cell formation techniques to be utilised and the operational procedures to be implemented.

This section is based on, and should be read in conjunction with, the Concept Design Report and associated design drawings (see Appendix B). The design has been developed to comply with the Guidelines. All design drawings are preliminary and subject to detailed design.

5.1 Proposal overview

PMHC is seeking approval under Part 4, Division 4.1 of the EP&A Act to expand the existing Cairncross Landfill located at the Cairncross WMF.

The Proposal will receive waste from all areas within the PMHC LGA including the major townships of Port Macquarie, Wauchope and Camden Haven. Waste will include general solid waste (i.e. putrescible and non-putrescible materials) and asbestos from domestic and C&I sources.

The key works for which approval is sought include:

- Progressive landfill cell construction, operation and rehabilitation of three landfill stages (Stages 1-3) including:
  - Clearing of existing vegetation
  - Construction of access tracks
  - Earthworks for cell formation including extraction and stockpiling of materials and the reapplication to form the leachate barrier (cell liner) as well as for daily, intermediate and final cover
  - Installation of leachate management structures including the leachate barrier, collection, storage and disposal system
  - Construction of a rising main to transfer leachate to the adjacent sewerage treatment plant (STP)[10]
  - Installation of a stormwater management system
  - Progressively increasing the annual waste acceptance rate at the landfill
  - Signage and other ancillary works
  - Rehabilitation of closed cells.
- Delineation and ongoing management of an approximately 50 m wide Koala connectivity corridor around the south-western border of the site.

Stages 1-3 of the Proposal are expected to receive a total of approximately 3.2 million tonnes of additional waste over the life of the expanded landfill and would be developed in stages as described in Section 5. The overall landfill life expectancy is 36 years (i.e. Stage 3 is expected to reach capacity in approximately 2056).

[10] The STP is proposed to be built in 2018 and is being designed to be capable of accepting leachate from Stages 1-3 of the Proposal.

5.1.1 Landfill layout and stages

As discussed in Section 1.1, it is proposed that the landfill expansion would be developed in three stages, from 2020 - 2056. Stages 1 - 3 are estimated to have capacity for approximately 3.2 million tonnes of waste. The proposed landfill layout and stages are shown in Figure 5-1 through Figure 5-5.

The staging boundaries have been modified from the original design contained within the *Cairncross Waste Management Facility Landfill Environment Management Plan (2001)* (2001 LEMP) (Connell Wagner, 2001) to better reflect the natural, final and floor levels of the landfill site, expected waste volumes and operational requirements. A general even distribution of area was also considered in the final stage layout.

The area consisting of Stage 1 and Stage 2 are within a catchment that drains south to land owned by State Forests NSW (Forestry Corp). The area within Stage 3 is in a catchment which drains to the east through Rawdon Creek Nature Reserve. The final leachate collection system also dictated the need to split catchments and define stages as shown below.

The staging boundaries have also been modified to allow for an approximately 50 metres wide Koala corridor to allow for the movement of Koalas in the south-east to the north-west of the site (see Figure 1-2).

The current operational Stage E landfill is progressing south towards the northern boundary of Stage 1 and 3 and is due for completion in approximately 2019.

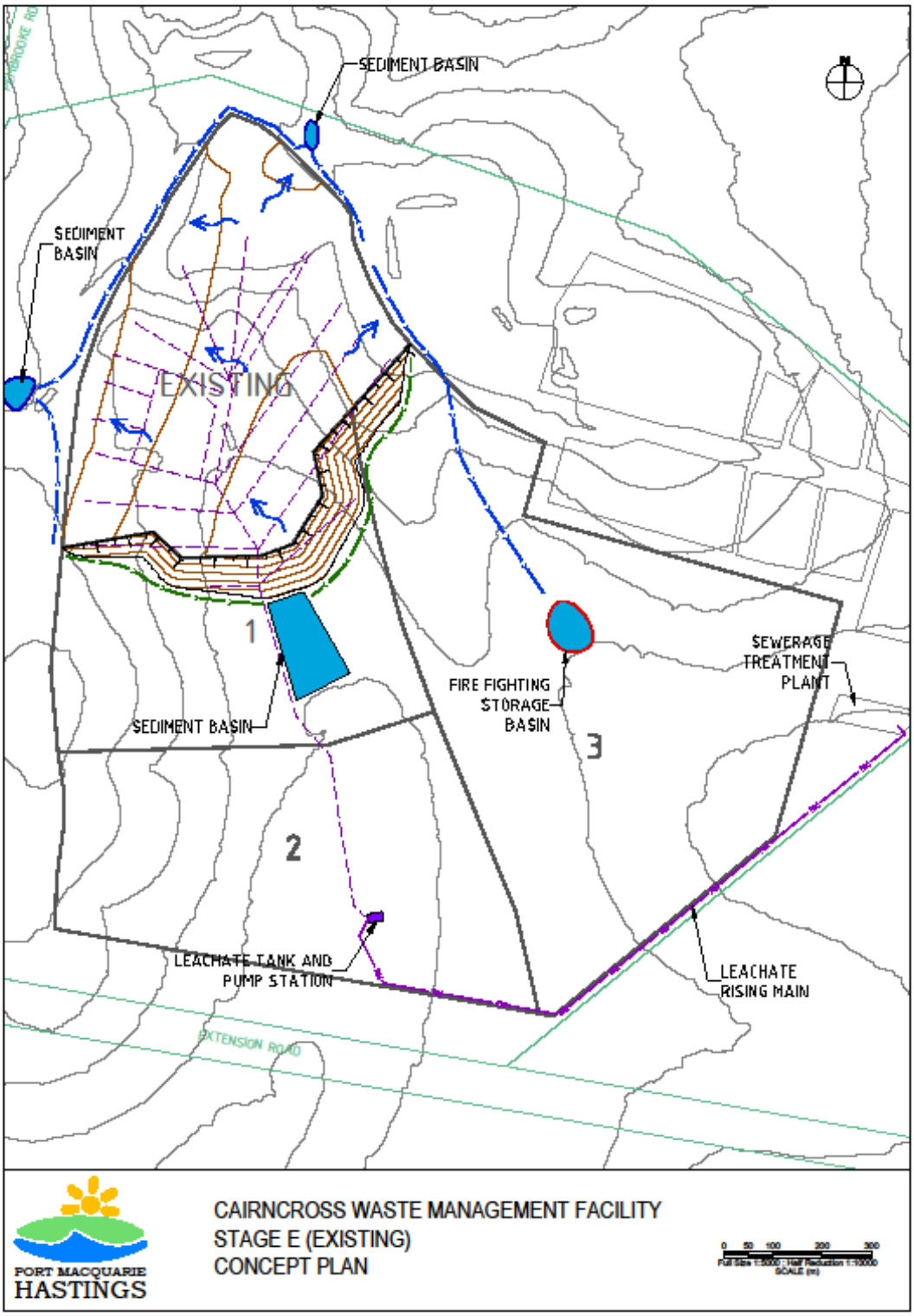


Figure 5-1 Proposed landfill layout and stages (Stage E)

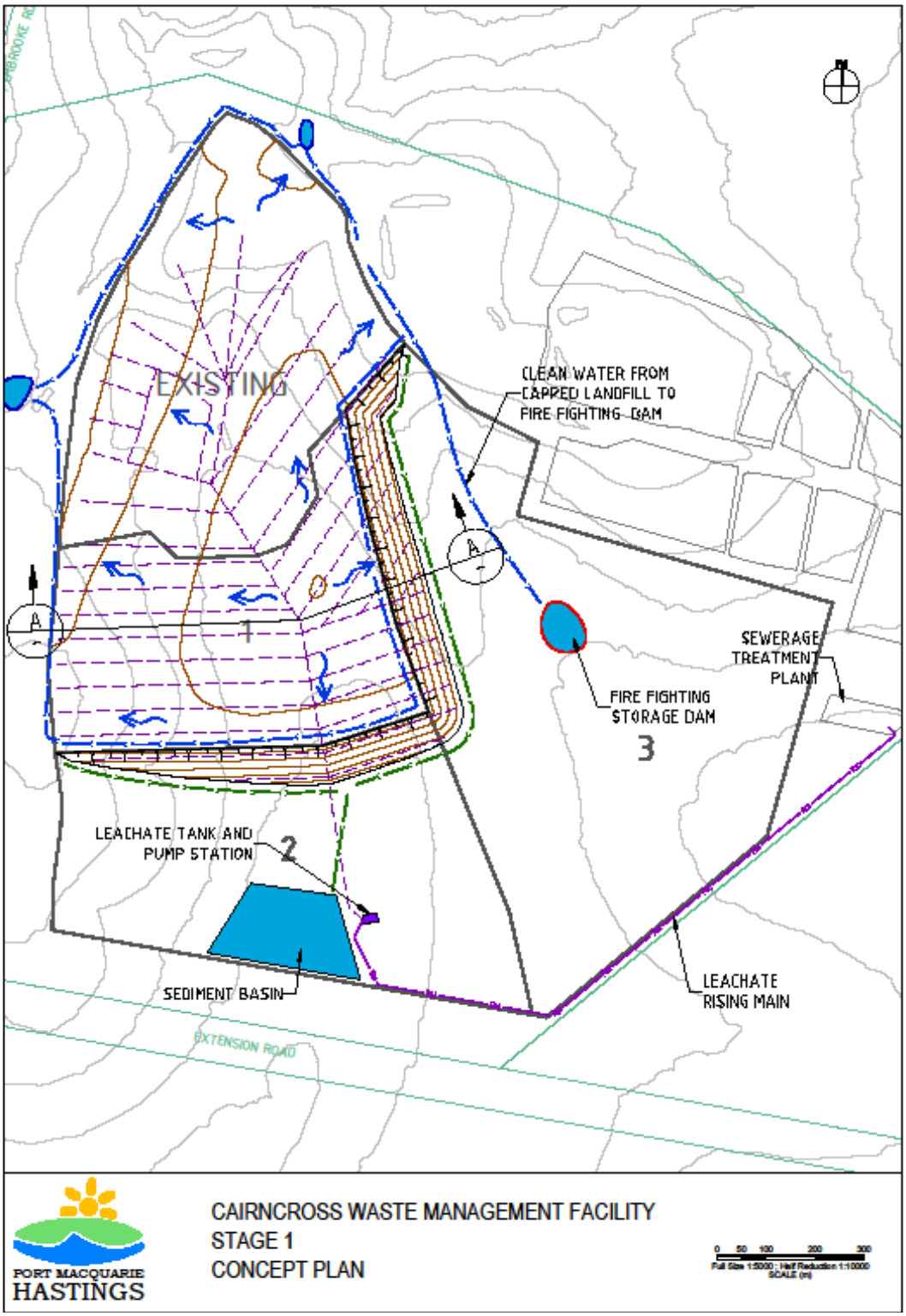


Figure 5-2 Proposed landfill layout and stages (Stage 1)

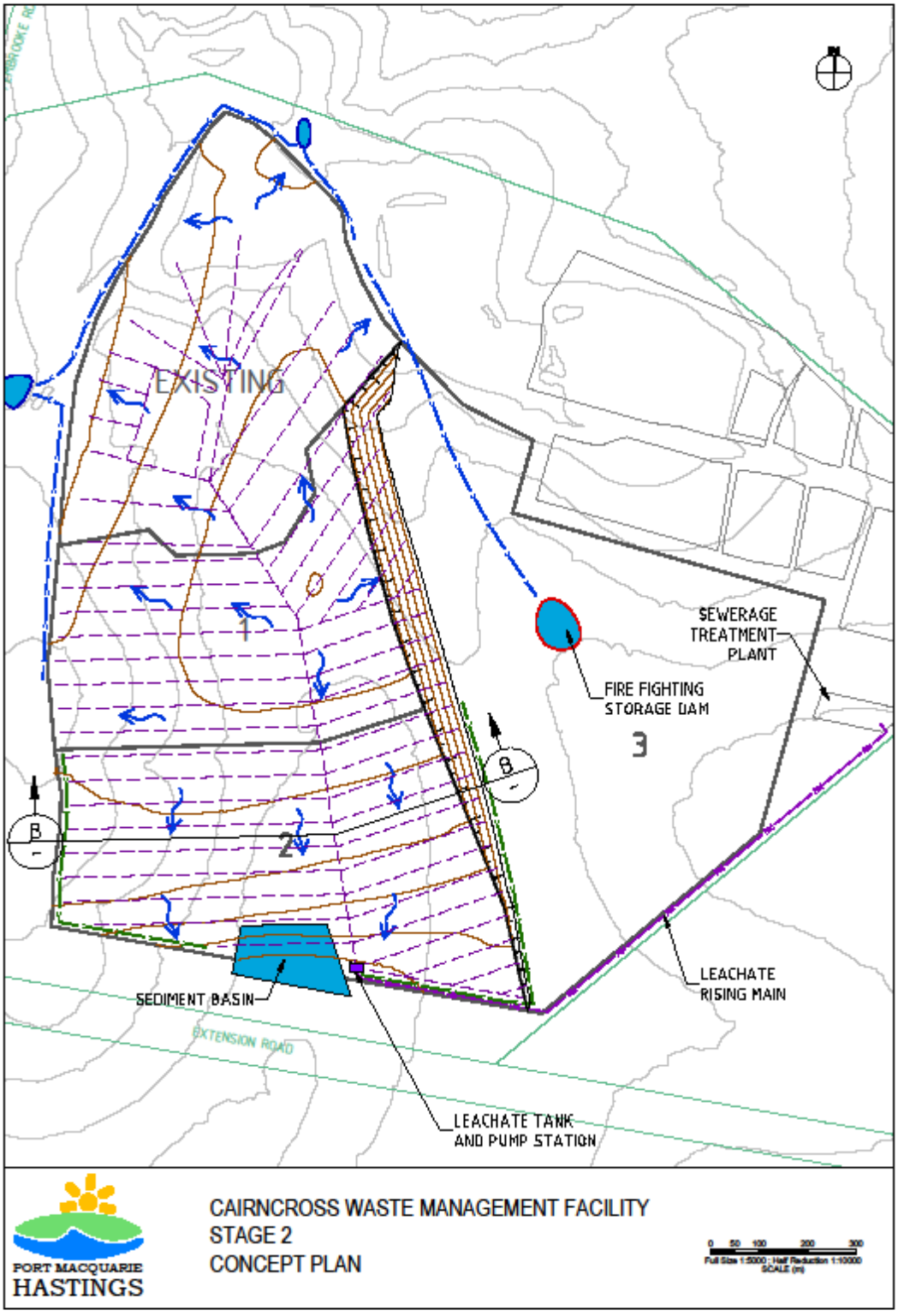


Figure 5-3 Proposed landfill layout and stages (Stage 2)

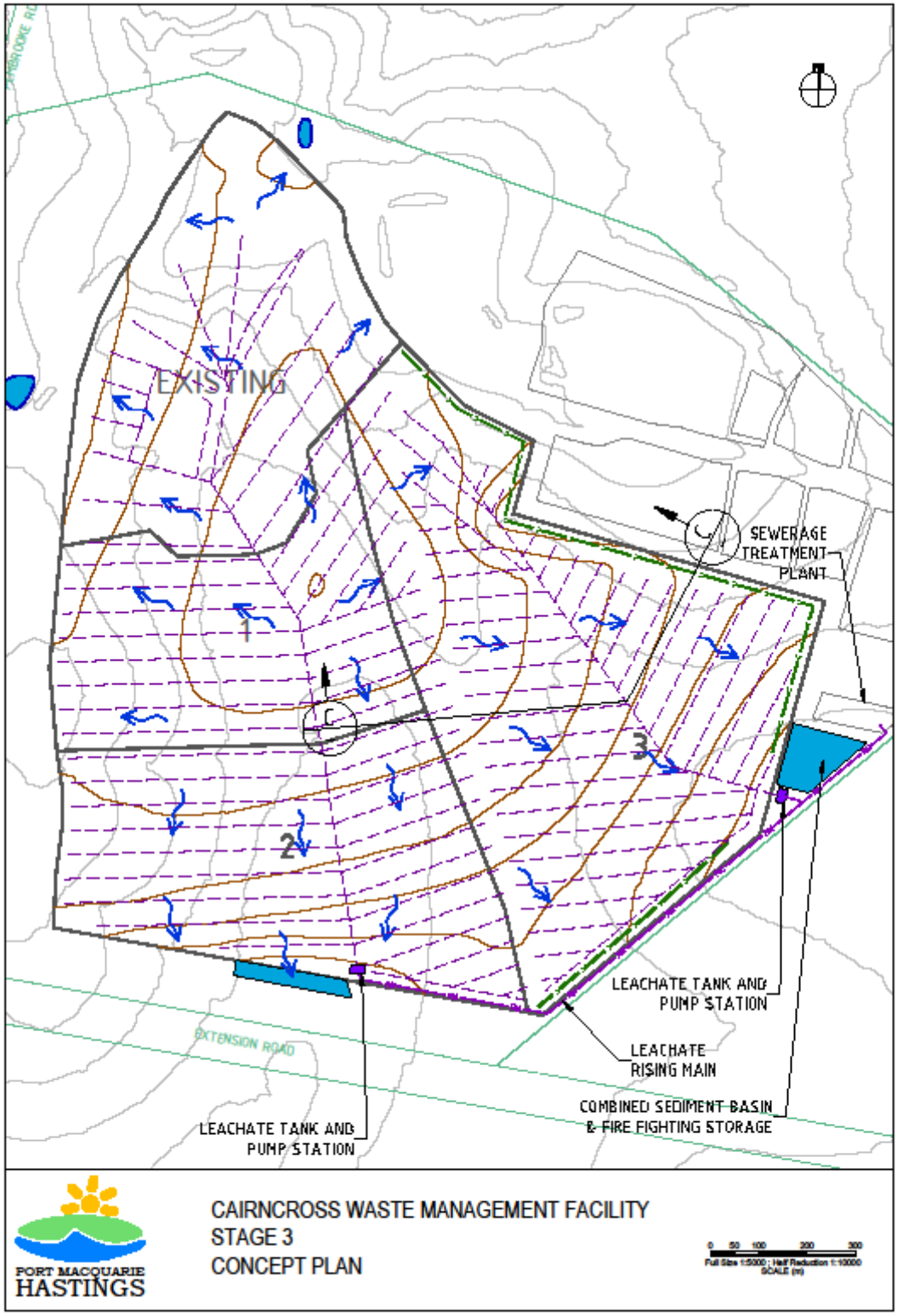


Figure 5-4 Proposed landfill layout and stages (Stage 3)

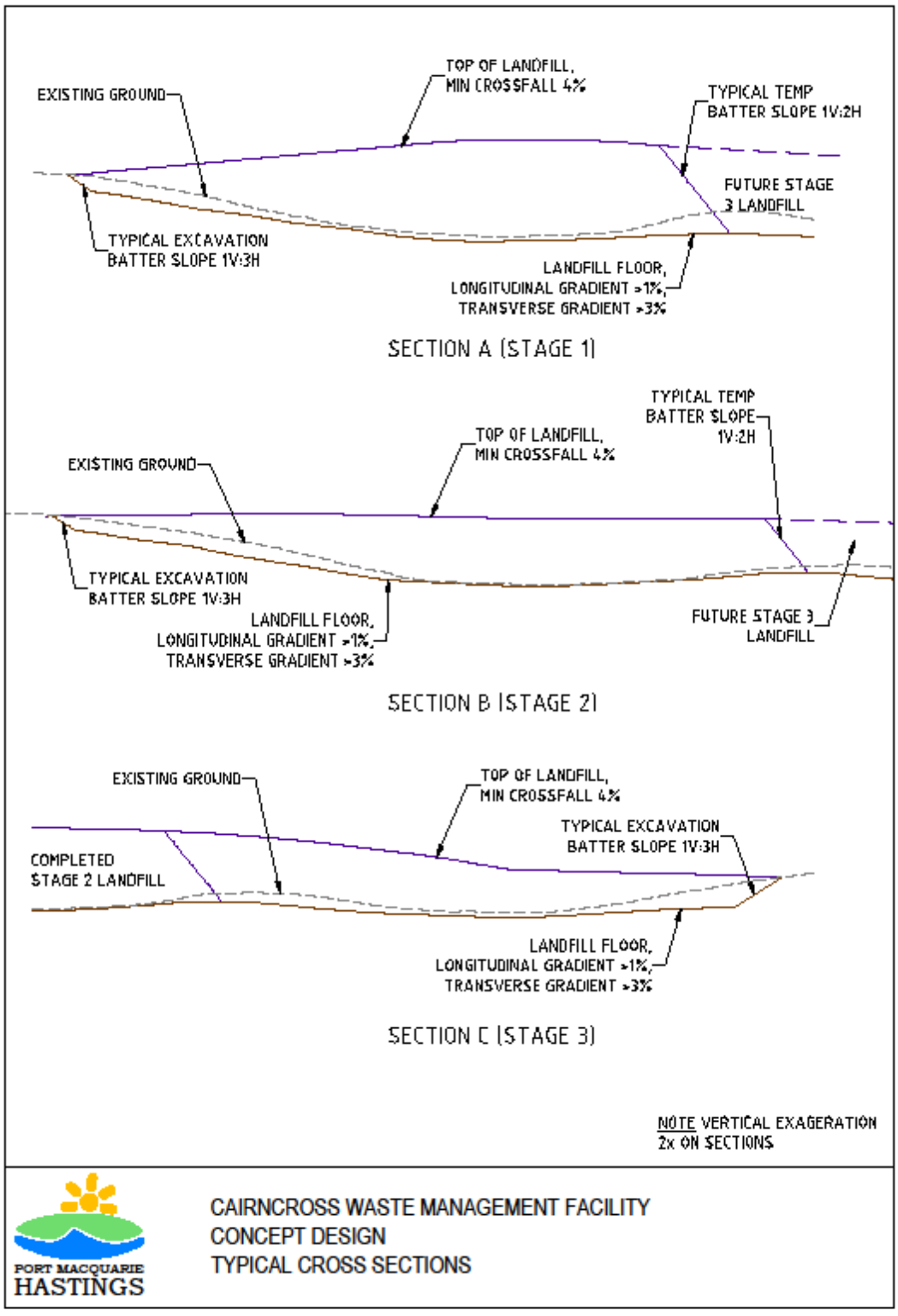


Figure 5-5 Proposed landfill typical cross sections

5.1.2 **Sequencing of stages**

Landfill excavation, liner construction and the installation of the leachate collection systems will continue to be undertaken in a staged manner to allow progressive capping of the previous landfill cell. To manage the operational aspects of this process, each stage has been further divided into sub-stages as shown on Figure 5-6.

The sub-stage areas have been selected based on operational experience gained from Stage E. The timeframes for development sequence are considered to be operationally efficient for clearing, excavation, liner preparation, waste filling, capping and closure (of the relevant sub-cell).

The sub-stages also include the benefit of minimising disturbed areas by reducing stormwater runoff and erosion, and limiting leachate generation by controlling the active landfill area.

A ‘typical’ development sequence is detailed in Table 5-1.

Table 5-1 Typical development sequence

Year	2047	2048	2049	2050
Construction of Cell 3A	X			
Landfilling Cell 3A		X		
Capping and closure of Cell 2F	X	X		
Clearing Stage 3B		X		
Construction of Cell 3B		X		
Landfilling Cell 3B			X	
Capping and closure of Cell 3A		X	X	
Clearing Stage 3C			X	
Construction of Cell 3C			X	
Landfilling Cell 3C				X

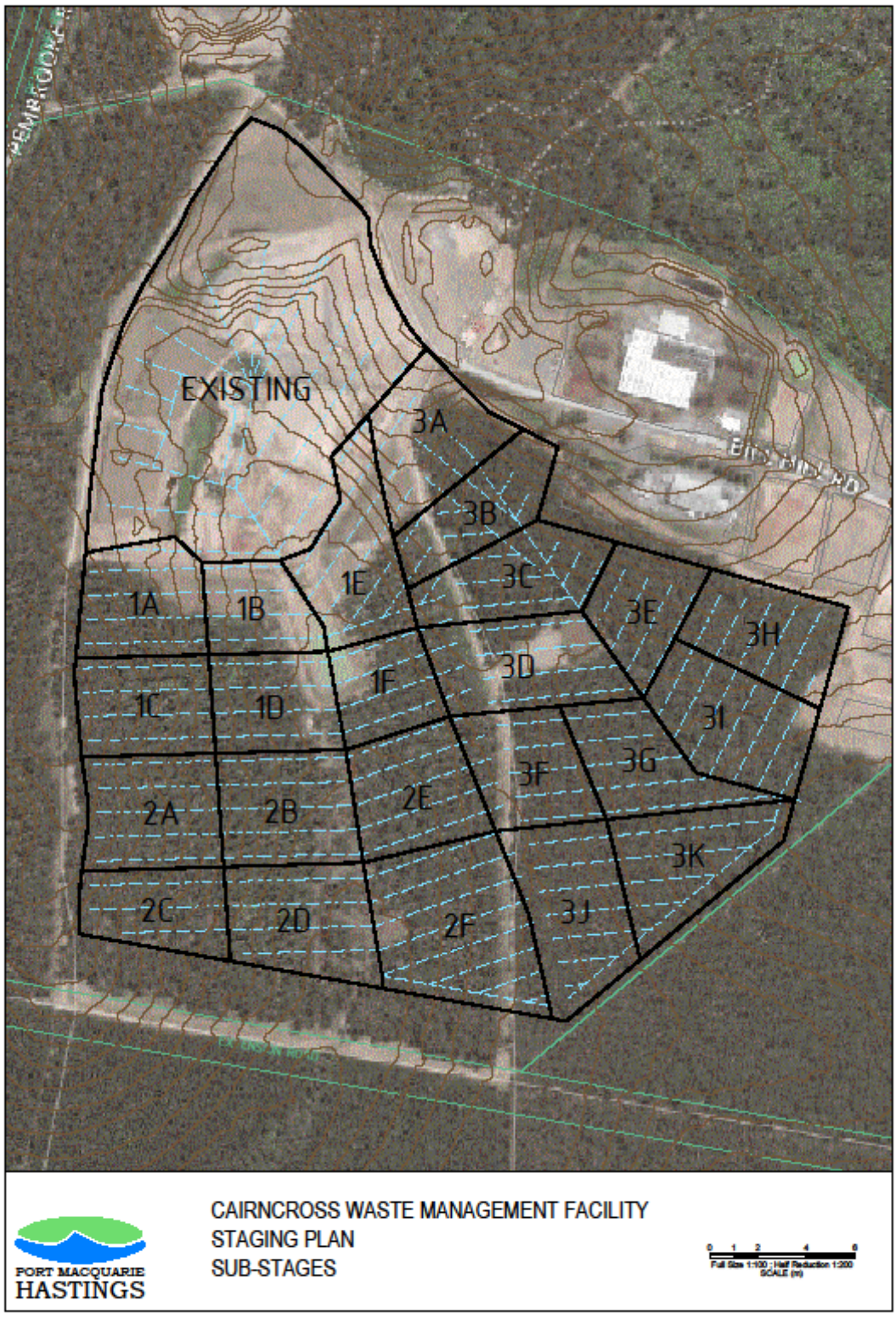


Figure 5-6 Proposed landfill (sub-stages)

5.1.3 Landfill floor level

The landfill floor level for Stages 1, 2 and 3 has been modified from the original design contained within the 2001 LEMP to better reflect groundwater conditions, maximisation of landfill void volume, and longitudinal/transverse floor gradients.

Trace Environmental (Trace) prepared the Hydrogeological Assessment, Cairncross Landfill Expansion (2016) report (Appendix F), that identifies 'average' long term groundwater and 'maximum' groundwater levels across the site. The adjusted floor level was set a minimum of two metres above the average long term groundwater level. This design parameter is in accordance with best practice requirements from the Victorian EPA guidelines, Siting, Design, Operation and Rehabilitation of Landfills; Best Practice Environmental Management, Publication 788.3 (August 2015) (Victorian EPA, 2015). The Victorian EPA guidelines were used given NSW EPA did not have any groundwater clearance/buffer guidelines at the time.

Floor levels were further adjusted where possible to maximise the landfill void volume whilst maintaining longitudinal gradients >1 percent, and transverse gradients >3 percent. Proposed landfill floor excavation levels are shown on Figure 5-7.

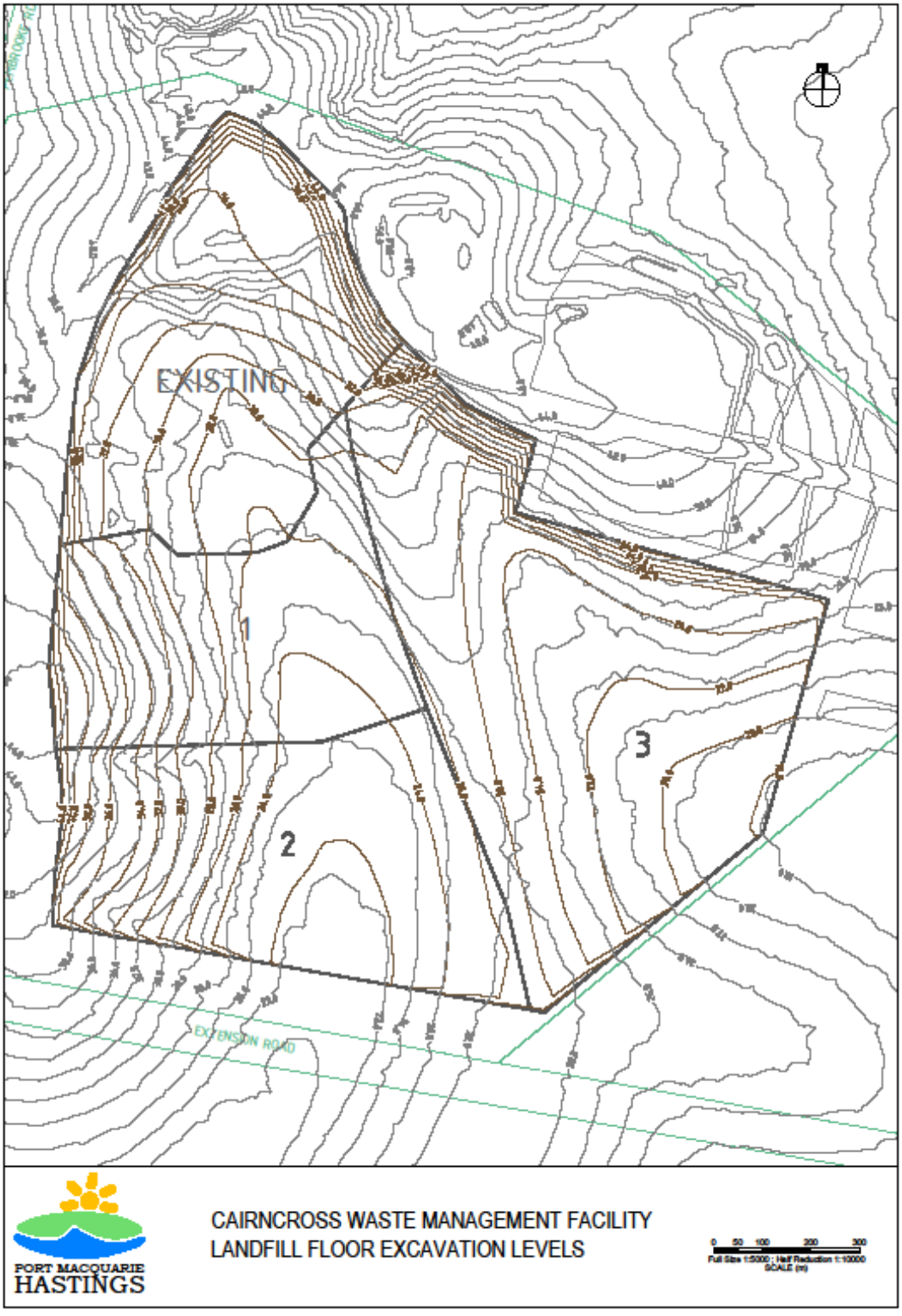


Figure 5-7 Proposed landfill floor excavation levels

5.1.4 Groundwater interception

As noted above, the revised landfill floor level was generally set at two metres above the ‘average’ long term groundwater level as detailed in the Hydrogeological Assessment (Trace, 2016).

During above ‘average’ groundwater level conditions, the excavation of the landfill cells may intercept groundwater, particularly in the south-western corner of the site (Stages 1 and 2) (Trace, 2016).

Figure 5-8 shows the estimated depths and locations where groundwater may be encountered by the landfill excavation. In order to avoid any risk of groundwater infiltration into the landfill cells, a gravel/rubble trench is proposed around the perimeter of the landfill at locations where groundwater may be encountered (Figure 5-8). The gravel trench will drain to the landfill low point at the southern perimeter, and prevent groundwater from entering the landfill cell during excavation and filling operations. The gravel trench is to remain operational following the closure of the landfill to prevent groundwater impacting the closed landfill.

The gravel trench will be typically 900 millimetres wide with 100 millimetres gravel installed with a geofabric surround. Depth of the trench will be to the ‘average’ groundwater level. Refer to Figure 5-9 for the typical cross section of the groundwater interception trench.

For further information on groundwater conditions refer to the Hydrogeological Assessment in Appendix F.

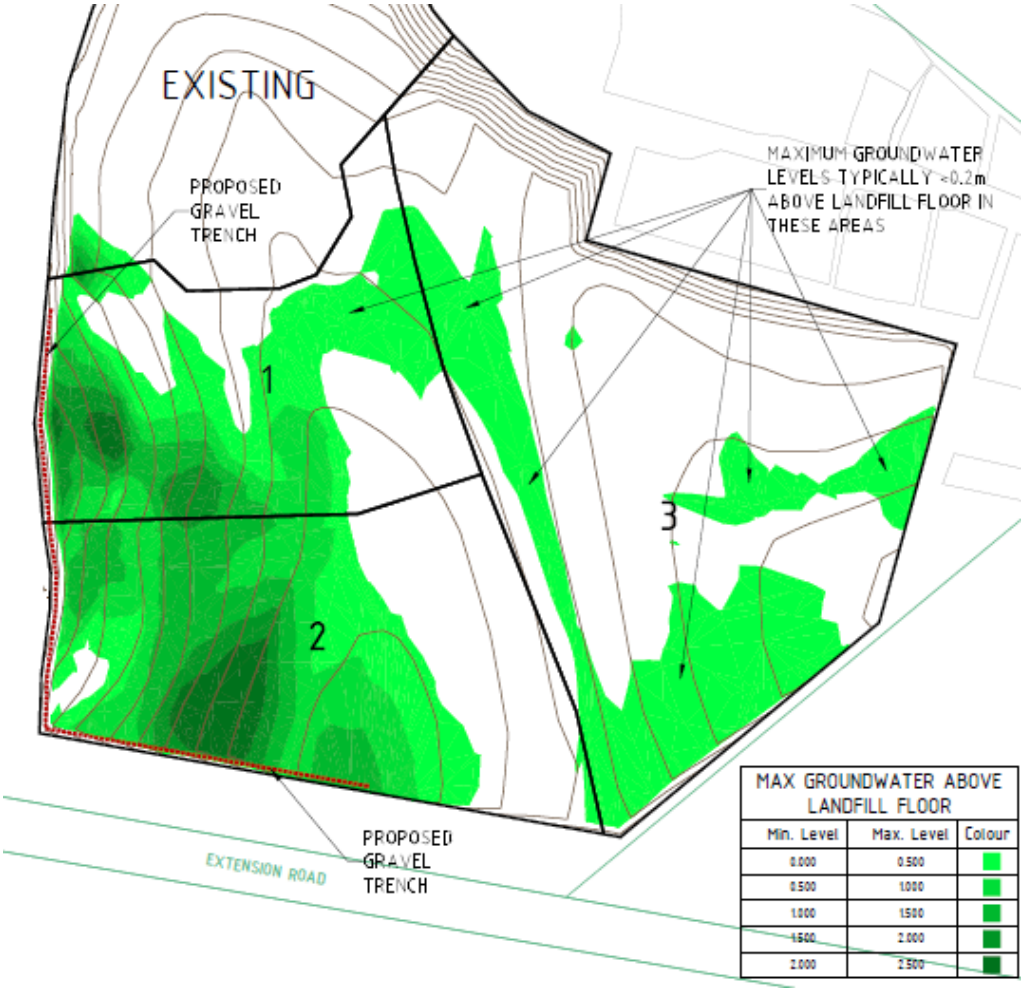


Figure 5-8 Areas where maximum groundwater levels are above the landfill floor level

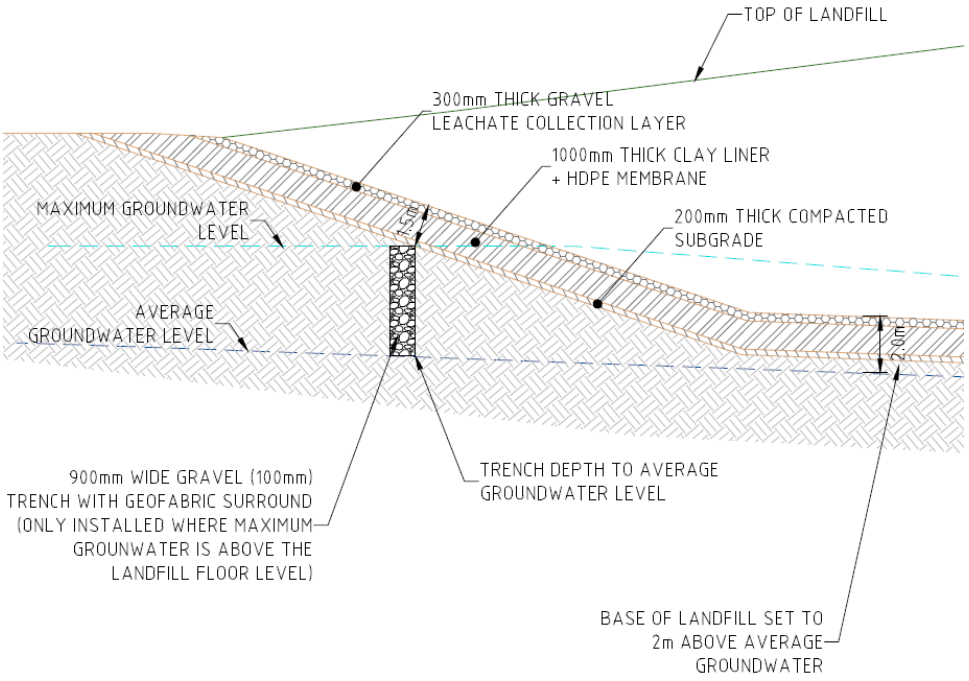


Figure 5-9 Groundwater interception trench - typical cross section

5.1.5 Final landform

The original final landform for the existing and future stages was presented in the 2001 LEMP. This final landform profile has been reviewed and generally adopted for future Stages 1, 2 and 3 given it maintains a similar profile to the surrounding landscape and is lower than the surrounding tree top canopy ensuring the landfill continues to be screened.

The following slope criteria were used to refine the final landform design:

- Maximum finished landform slope of 1V:4H to allow maintenance (mowing) of finished surface after capping
- Minimum finished landform slope of 1V:25H (4 percent grade) to ensure rainfall sheds from the surface and does not infiltrate the landfill
- A temporary batter of 1V:2H will be used between stages to ensure leachate and waste is contained appropriately and to limit the use of excess fill.

The proposed final landform levels are shown in Figure 5-10.

5.1.6 Earthworks and materials balance

Table 5-2 presents the estimated earthworks and materials balance for the existing and future landfill stages. While every care has been taken to estimate these volumes, actual volumes may vary following the detailed design and construction.

Table 5-2 Materials Balance Summary

Stage	E	1	2	3
Area (m^2)	102,063	79,453	103,992	168,907
Topsoil Stripping Volume (m^3)[11]	30,619	23,836	31,198	50,672
Clay Excavation Volume (m^3)	554,362	290,668	285,817	705,181
Leachate Barrier Clay Vol (m^3)	91,857	79,453	103,992	168,907
Cap Clay Volume (m^3)	81,650	127,125	166,387	270,251
Vegetation Layer Topsoil Vol (m^3)	30,619	23,836	31,198	50,672
Landfill Void Volume (m^3)	1,435,997	1,610,181	1,016,705	1,541,718
Day Cover Clay Required (m^3) (10% of void)[12]	143,600	161,018	101,671	154,172
Actual Landfill Void Volume (m^3) (less day cover volume)	1,292,397	1,449,163	915,035	1,387,546

[11] Assumes 300 mm depth of topsoil.

[12] Based on actual measured volumes within Stage E needed to achieve 150 mm daily cover.

Stage	E	1	2	3
Total Clay Required (m^3)	317,107	367,596	372,050	593,330
Clay Balance (m^3) (-ve = deficit)	237,255	-76,925	-86,233	111,851

A summary of each stage's earthworks is presented below.

Stage E: Excess clay excavated is in the order of 237,000 metres^3. This clay is presently stockpiled on site for use within future stages.

Stage 1: Clay deficit for this stage is due to reduced excavation depth, increased final capping thickness and higher day cover volume (compared with Stage E). The estimated clay deficit will be addressed by the excess clay stockpile from Stage E.

Stage 2: Clay deficit is due to reduced excavation depth, increased final capping thickness (compared with Stage E). Reduced landfill void volume due to floor and final landform intersecting existing ground levels. The estimated clay deficit will be addressed by the excess clay stockpile from Stage E.

Stage 3: Excess clay excavated from this stage is in the order of 112,000 metres^3. Overall excess clay from all stages expected to be in the order of 186,000 metres^3.

PMHC anticipate this excess material will be classified as virgin excavated natural material (VENM) and will be temporarily stockpiled on site, prior to removal for offsite application on future council civil or road work projects (under separate approvals, where required). Potential re-use applications include filling development land above flood levels, widening road embankments, bridge abutments and approaches.

Re-use of this excess material is in line with PMHC's strategy to avoid waste. Compaction and permeability testing will be undertaken at the time of extraction to determine its suitability for the various uses. This information will be recorded along with quantities estimated via volumetric surveys for EPL/waste levy requirements.

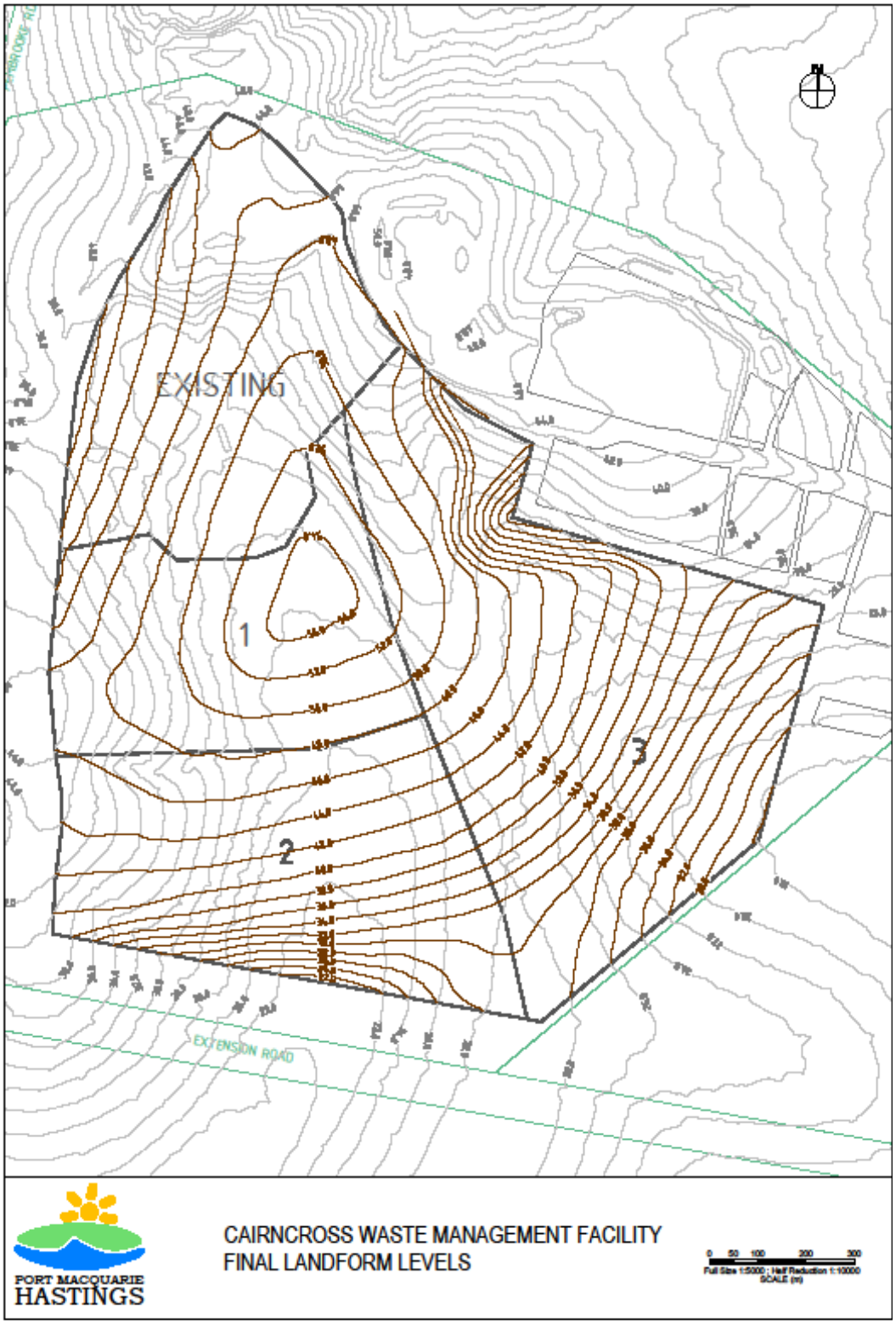


Figure 5-10 Final landform levels

5.2 Built form and infrastructure

5.2.1 Fencing

Chain wire fencing will be installed around the active landfill stage. The Koala corridor will remain unfenced until Stage 2 is developed, at which time a fence will be installed between the Stage 2 area and the Koala corridor.

5.2.2 Waste processing areas

No waste will be processed as part of the Proposal. Loads will be inspected on entry to the Proposal Site for dangerous or other unacceptable materials and, if found present, entry to the landfill for disposal will be refused. Where suitable facilities exist for the processing or disposal of waste on other parts of the Cairncross WMF, drivers will be redirected to those facilities.

5.2.3 Water storage

Operational water for dust suppression, irrigation and firefighting will be collected in the sediment basins (to be constructed below each stage) and the firefighting dam (see Figure 5-1 to Figure 5-4).

The volume of the existing fire-fighting water storage dam is approximately 3000m^3. This storage dam would remain in its current location during Stage 1 and 2, being relocated to the eastern side of Stage 3 prior to the commencement of landfilling in the Stage 3 area.

5.2.4 Internal roads and fire trails

Internal roads and fire trails will be constructed as required from recycled concrete or external rock from existing quarries as follows:

- A 20 metre wide Defendable Space would be provided to each Leachate Tank
- The existing fire trail adjacent to the south-eastern boundary would be upgraded and maintained to provide an all-weather access having a width of four metres within a six metre corridor kept clear of shrubs and grasses. The trail would be located within the Strategic Fire Advantage Zone and shall be constructed to provide access for a fully laden 15 tonne [GVM] Rural Fire Service/State Forests Category 1 Tanker
- The existing Fire Trail to the west of Stage 1 & 2 and between Stages 2 & 3 shall be retained and maintained to provide an all-weather access for a fully laden 15 tonne [GVM] Rural Fire Service/State Forests Category 1 Tanker
- A 30 metre wide Strategic Fire Advantage Zone would be provided and maintained along the boundary with the adjoining Nature Reserve
- There would be provided to the perimeter of each incremental landfill cell a temporary fire trail which connects to the existing/proposed perimeter/internal fire trail network. The temporary trail would be capable of carrying a fully laden NSW Rural Fire Service/State Forests Category 1 Tanker.
- All roads will be graded and drained through silt traps and sedimentation ponds before discharge from the site.

5.2.5 Signage

Directional signs are already provided at the intersection of the Pacific Highway and the Cairncross WMF entrance gate and at the weighbridge. Signs advise motorists of speed limits, hours of operation, charges, types of waste accepted and other relevant information. Some minor additional signage may be required as part of the Proposal for the three stages.

5.3 Stormwater management strategy

5.3.1 Existing system

The initial site selection within the head of a catchment has ensured that necessary surface drainage controls will be limited to the operational area of the landfill and a small lateral catchment area immediately adjoining the landfill.

The overarching principle guiding water management on the site is to discretely capture clean water and dirty water from the Proposal Site so that it can be used on site to minimise external water supply requirements or be treated prior to discharge or evaporation. This includes the requirements for appropriate erosion control, sediment control and stormwater management.

There are currently a number of surface water management features in place at the site. The primary objective of the surface water management features is to ensure that relevant water quality objectives are achieved for stormwater discharged from the site. These measures will continue to be implemented as described in Section 5.3.2.

5.3.2 Proposed stormwater management system

The stormwater management details for the Proposal are shown in Figure 5-1, Figure 5-2, Figure 5-3 and Figure 5-4. Stage 1 and Stage 2 would drain via a broad ephemeral gully (A) south via a culvert under Extension Road to land owned by State Forests NSW (Forestry Corp). While Stage 3 drains via an ephemeral gully (B) to Rawdon Creek Nature Reserve in the east.

The final landform (see Figure 5-10) will redirect stormwater runoff from the western ephemeral gully (A) to the eastern ephemeral gully (B). At the completion of filling operations approximately 4.3 hectares will be redirected from the eastern ephemeral gully A catchment to the eastern ephemeral gully B catchment.

This small redirection of stormwater runoff is not considered to be significant and not expected to impact the downstream environments given both gullies (A) and (B) ultimately drain to Rawdon Creek, approximately two kilometres to the south of the Cairncross WMF via generally ephemeral watercourses. In addition, the overall catchment size is approximately 1,000 hectares, and the redirection of 4.3 hectares represents only 0.4 percent reduction in the local sub-catchment.

The stormwater management strategy for Stage 1, 2 and 3 will maintain and improve upon existing techniques implemented in the existing Stage E landfill operation area. The general approach for stormwater management at each future stage will include the following aspects:

- Internal roads are gravelled to prevent softening and erosion during wet weather
- Roadside table drains and drainage channels are constructed where required to direct stormwater away from erosion prone areas
- Table drains and channels are grassed or rock armoured to prevent scouring
- Sediment traps are used where possible to collect sediment prior to stormwater reaching the sediment basin

- A large sediment basin is utilised as end-of-line treatment for all stormwater runoff from the site. The basin outlet is controlled via a manual valve which is generally released five days after a rainfall event to ensure maximum sediment capture. The basin is cleaned as required. Spillways are to be provided to all sediment basins and designed for major storm events (up to 100-year average recurrence interval (ARI))
- Covering of waste (day cover) is completed with compacted clay, trimmed and graded to encourage runoff of rainwater
- Final contouring of landfill areas is designed to assist water runoff and direct water to relevant stormwater sediment basins before being discharged from the site
- Maintenance is carried out on all stormwater infrastructure to ensure control measures are operational prior to rainfall events
- Clearing and stripping of new landfill sub-cells is done progressively to limit runoff and control sediment runoff.

5.4 Erosion control

As discussed in further detail in Section 8.3, 8.4, 8.5 and in the Concept Design Report (Appendix B), the Proposal would incorporate the following measures to minimise the volume of sediment-laden stormwater generated from the disturbed areas of the site during rainfall events:

- Minimise the area of exposed soils
- Stabilise exposed areas
- Reduce erosive effect of stormwater
- Protect stockpiles with silt fencing
- Manage unsealed roads
- Landfill exit controls (shaker pad and wheel wash located in broader Cairncross WMF)
- Maintenance of all erosion control structures.

5.5 Sediment control

As discussed in further detail in Section 8.3 and 8.4, and in the Concept Design Report (Appendix B), the main source of sediment control for Proposal will be the staged clearing of landfill areas and inclusion of sediment basins. The staged clearing minimises disturbed areas by reducing stormwater runoff and erosion. Other measures may include vegetative buffers and silt fences. One large sediment basin would be constructed for each stage of the Proposal, as shown in Figure 5-1 to Figure 5-4, to ensure stormwater discharged from the site is of suitable quality.

As required by the Guidelines, sediment basin sizes have been calculated using the spreadsheet method supplied with *Managing Urban Stormwater: Soils and Construction Volume 2B Waste Landfills* (the Blue Book) (Department of Environment and Climate Change NSW (DECC), 2008). The sediment basins have been designed to capture and treat all sediment-laden runoff during a 90th-percentile five-day rainfall event. See Appendix B for further information on sediment basin design.

5.6 Leachate management strategy

5.6.1 Existing leachate barrier and collection system

A leachate barrier system is installed within the floor of all Stage E sub-cells comprising compacted clay 900 millimetres thick (max. permeability $1x10^{-9}$ m/s).

A leachate collection system (2 x 100 millimetres PVC slotted drainage lines covered with 100 millimetres diameter crushed rock) convey leachate to a collection tank where leachate is pumped to leachate infiltration/recirculation basins. When leachate volumes exceed infiltration capacities, leachate is transported off site to a STP.

5.6.2 Proposed leachate barrier system

A landfill cell liner (leachate barrier system) is to be constructed for Stage 1, 2 and 3 of the Proposal in accordance with the Guidelines. The liner would comprise:

- 200 millimetres thick compacted clay sub-base
- 1,000 millimetres thick compacted clay liner (hydraulic conductivity $<1x10^{-9}$m/s)
- 2 millimetres thick HDPE flexible membrane liner
- Cushion geotextile fabric to protect the HDPE liner
- 300 millimetres thick gravel leachate collection drainage layer including leachate collection pipes (2 x 100 millimetres slotted PVC at intervals of 25 metres). NB: Refer to Pacific Environment Limited report *Cairncross Landfill Leachate Generation Modelling (2016)* for sizing details.
- Separation geotextile fabric to reduce the ingress of fines from the overlying waste.

Refer to Figure 5-11 for a typical section of the proposed leachate barrier system.

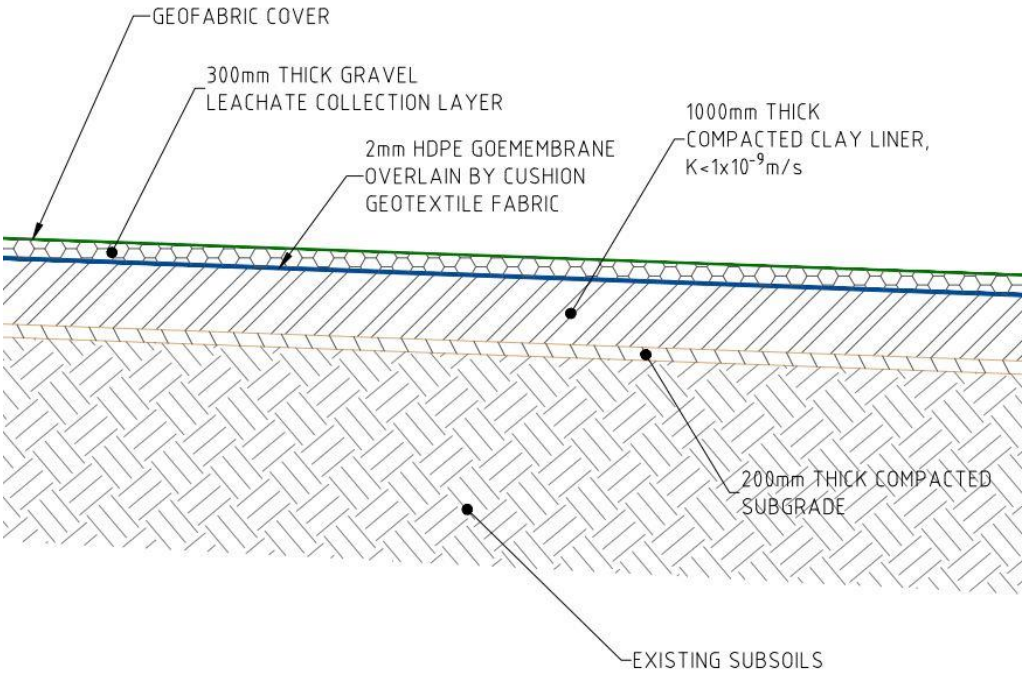


Figure 5-11 Landfill cell liner typical section

5.6.3 Proposed leachate collection system

The leachate collection network has been designed in accordance with the Guidelines. Refer to Figure 5-1 to Figure 5-4 for the leachate collection system layout.

The Cairncross Landfill Leachate Generation Modelling (Pacific Environment, 2016) (Leachate Report) (Appendix H) report confirmed that: *leachate reticulation pipes utilised for Stage E (2 x 100 millimetres diameter pipes), will be suitable for all future stages with regards to discharge velocity and flow rate.* The Leachate Report also provides information on leachate flow rates for each stage/catchment.

The leachate collection system will comprise a network of two x 100 millimetres slotted PVC pipes within a 300 millimetres thick gravel layer covering the landfill liner. The maximum spacing of leachate pipes will be 25 metres, laid at longitudinal grades of >one percent, and >three percent transverse grade.

5.6.4 Leachate storage and disposal

Recommendations within the Leachate Report (Pacific Environment, 2016) regarding leachate tank design have been adopted for the Proposal. The tanks will:

- Be above ground bunded tanks
- Have sufficient leachate storage volume, as determined by using a water balance methodology
- Have a visible marker to indicate the bottom depth of the required freeboard
- Be surrounded by a bund with a capacity of at least 110 percent of the tanks volume.

Leachate will drain by gravity to a leachate tank and pump system. Refer to Figure 5-1 to Figure 5-4 for the leachate tank and pump system layout.

The leachate storage tanks are sized to accommodate two days storage of leachate at the maximum predicted rate. The flow rates, typical layout and cross section for the proposed leachate storage tanks are detailed in the Leachate Report (Appendix H).

Construction commenced in 2016 for a new leachate tank location to serve the remainder of Stage E and for Stage 1. This new tank location (within Stage 2) is in accordance with the 2001 LEMP *a*nd OEMP.

The tanks will initially be pumped via rising main to the existing infiltration basins. However, PMHC will shortly commence construction of a new STP to be built within the Cairncross WMF Industrial Precinct. Once complete, the leachate from the Proposal will be pumped to the STP for treatment and disposal from the site.

The new STP itself does not form part of this Proposal. The STP will be managed by PMHCs Water and Sewer section and is being specifically designed to accommodate the leachate characteristics and estimated flow rates. The new STP will provide sufficient treatment to allow disposal of effluent (including treated leachate) to the environment in accordance with the POEO Act administered by the NSW EPA.

Leachate volumes will be measured by flow metres before entering primary holding tanks within the STP. These holding tanks are expected to provide further storage capacity if required. Typical layout and a cross section for the proposed leachate storage tanks, as well as the STP functional layout and process diagram, is provided in the Concept Design Report (Appendix B).

5.7 Landfill gas management

As discussed in further detail in Section 8.9, PMHC has commissioned a number of investigations to estimate the predicted rate of landfill gas generation from the existing and proposed landfill stages. The predicted greenhouse gas emissions varied from study to study and this highlighted the difficulty in modelling the emissions, signalling the need for a landfill gas pumping trial at Cairncross WMF.

PMHC are currently conducting a landfill gas pumping trial at Cairncross WMF. The pumping trial is being conducted to assess the actual rate of methane generation from a 'typical' zone within the landfill, the concentration of methane during active extraction, and will provide a forecast of future extraction rates/concentrations within the landfill. The trial will also make recommendations on the future landfill gas management at the site and is expected to be completed by late-2017.

The extent of gas controls to be designed and implemented for the existing and future stages of landfill will be guided by the results of the gas pumping trial. PMHC will develop a landfill gas management plan based on the findings of the trial.

As required by the Guidelines, waste would be covered daily and at intermediate stages of operation to minimise the emission of landfill gas.

PMHC undertakes a landfill gas monitoring program for the Stage E landfill and this program would be continued for the Proposal as described in Section 8.9.4

5.8 Establishment of Koala connectivity corridor

Establishment of the Koala corridor would involve fencing off the Stage 2 landfill area adjacent to the corridor to prevent migration of Koalas onto the Proposal Site. In order to maintain connectivity, the Koala corridor would not be fenced on other sides. Prior to commencement of landfilling in the adjacent Stage 2 area, a qualified ecologist would survey the Koala corridor to identify the need for weed management and/or the planting of additional Koala food trees.

5.9 Landfill operations

5.9.1 OEMP requirements and standard operating procedures

The existing OEMP for Stage E would be updated with specific chapters related to Stages 1-3 landfilling activities. Over time the OEMP will be reviewed and updated and Stage E aspects can be deleted. The OEMP would be developed in accordance with the Guidelines and would build on and consolidate the knowledge gained from operation of the existing landfill since its opening in 2000. Standard Operating Procedures (SOPs) outlined in PMHC's *Solid Waste Management: Operational Policies, Standard Operating Procedures and Safe Work Method Statements* (SOPs Manual) (PMHC, 2013) (Appendix F) would be revised where necessary to accommodate changes in operational procedures in the Guidelines applicable to Stages 1-3.

5.9.2 Types of waste accepted

The Proposal would continue to receive general solid waste (putrescible and non-putrescible) as defined under the POEO Act. These waste classifications are described below. The Proposal Site would also continue to accept asbestos and any waste that is below the licensing thresholds prescribed in Schedule 1 of the POEO Act. Asbestos management procedures are described in Section 5.9.5.

General solid waste (putrescible)

The following wastes (other than special waste, liquid waste, hazardous waste or restricted solid waste) have been pre-classified by the EPA as 'general solid waste (putrescible)':

- Household waste that contains putrescible organics
- Waste from litter bins collected by or on behalf of local councils
- Manure and night soil
- Disposable nappies, incontinence pads or sanitary napkins
- Food waste
- Animal waste
- Grit or screenings from sewage treatment systems that have been dewatered so that the grit or screenings do not contain free liquids
- Any mixture of the wastes referred to above.

General solid waste (non-putrescible)

The following wastes (other than special waste, liquid waste, hazardous waste, restricted solid waste or general solid waste (putrescible)) are pre-classified as 'general solid waste (non-putrescible)' and would continue to be accepted for landfilling. It is noted that many non-putrescible materials would be diverted from the landfill for recycling and reprocessing at the MRF and ORRF, thereby reducing the quantities of these wastes entering the landfill. The landfill would continue to accept the following types of non-putrescible general solid waste:

- Glass, plastic, plasterboard, ceramics, bricks, concrete or metal
- Paper or cardboard
- Household waste from municipal clean-up that does not contain food waste
- Waste collected by, or on behalf of, local councils from street sweepings
- Grit, sediment, litter and gross pollutants collected in, and removed from, stormwater treatment devices and/or stormwater management systems, that has been dewatered so that they do not contain free liquids
- Grit and screenings from potable water and water reticulation plants that has been dewatered so that it does not contain free liquids
- Garden waste
- Wood waste
- Waste contaminated with lead (including lead paint waste) from residential premises or educational or child care institutions
- Containers, previously containing dangerous goods, from which residues have been removed by washing or vacuuming
- Drained oil filters (mechanically crushed), rags and oil-absorbent materials that only contain non-volatile petroleum hydrocarbons and do not contain free liquids and drained motor oil containers that do not contain free liquids
- Non-putrescible vegetative waste from agriculture, silviculture or horticulture
- Building cavity dust waste removed from residential premises or educational or child care institutions, being waste that is packaged securely to prevent dust emissions and direct contact

- Synthetic fibre waste (from materials such as fibreglass, polyesters and other plastics) being waste that is packaged securely to prevent dust emissions, but excluding asbestos waste
- VENM
- Building and demolition waste
- Asphalt waste (including asphalt resulting from road construction and waterproofing works)
- Biosolids categorised as unrestricted use, or restricted use 1, 2 or 3, in accordance with the criteria set out in the Biosolids Guidelines (EPA 2000)
- Cured concrete waste from a batch plant
- Fully cured and set thermosetting polymers and fibre-reinforcing resins
- Fully cured and dried residues of resins, glues, paints, coatings and inks
- Any mixture of the wastes referred to above.

Excluded wastes

The following wastes are excluded from disposal at the Proposal Site:

- Liquid wastes
- Radioactive wastes
- Any explosive or flammable material including material derived from grease, oil, tar, shale or coal
- Any sludge or refuse material (unless it can be shown to be harmless) from any:
  - Tanning or leather processing plant
  - Petroleum or petrochemical plant
  - Chemical plant
  - Paint manufacturing plant
  - Metal treatment plant
  - Vegetable oil or mineral oil plant
  - Pharmaceutical or drug manufacturing plant
- Any material containing arsenic, cadmium, cyanide, lead, mercury, selenium and sulphide
- Any toxic inorganic material, including soluble salt of barium, boron, chromium manganese, silver or zinc
- Any toxic organic material, including any pesticide or herbicide, in particular any containing:
  - Chlorinated hydrocarbons
  - Fluorinated hydrocarbons
  - Organophosphates
  - Organochlorines
  - Carbamates or thiocarbamates and phenols
- Any soluble acid or alkali or acidic or basic compound, unless it can be shown that it may be beneficial
- Clinical wastes

- Contaminated wastes
- Cytotoxic wastes
- Hazardous wastes.

5.9.3 Waste monitoring and recording

The Guidelines require that the occupier of a landfill must implement waste acceptance, reporting and site security procedures that meet the following goals:

- Only authorised wastes must be received at the site
- Any unauthorised wastes delivered to the site must be appropriately managed and disposed of lawfully
- Statutory record-keeping and reporting requirements must be complied with
- The premises must be secure, and unauthorised entry must be prevented.

To meet these requirements, vehicles entering and exiting the site would pass through the existing weighbridge and entrance station. The weighbridge operator would inspect incoming waste, except where it is enclosed within a kerbside collection truck. Any load containing waste of a type not accepted at the depot would be refused entry at that point and the details recorded.

Where waste is acceptable, a fee would be collected or details recorded for account billing. All heavy vehicles would be weighed to determine the appropriate charge. Light vehicles and trailers may be weighed.

As noted above, the Stage E landfill will continue to operate under the existing and approved OEMP. The OEMP would be updated in accordance with the Guidelines, to include the Proposal covering Stages 1 to 3 landfilling activities.

The OEMP for the Cairncross WMF includes a range of measures to ensure the quantities of waste delivered to the Proposal Site are accurately measured. These would be modified in accordance with the Guidelines, POEO Waste Regulation and *New Requirements for Weighbridge*s (NSW EPA, 2015) and will include:

- The *New Requirements for Weighbridges* require that operators must verify weighbridges against the Commonwealth National Measurement Act 1960 at least once a year for accuracy and reliability
- The weighbridges would be operational at all times. If, at any time, the weighbridges should cease operation, the EPA would be notified immediately and the weighbridges repaired immediately
- Each month, data will be provided to the EPA regarding the amount, type and source of waste according to the National Waste Classification System
- A summary report on the quantity of waste received at the Proposal site will be lodged with the EPA every 12 months
- Every six months, a survey of the site will be undertaken by a registered surveyor to confirm the volume of landfill space consumed in the previous six months. This report will be submitted to the EPA to demonstrate that the quantities of waste recorded by the weighbridge (for the 12 month period) are the same as those committed to the landfill
- The details of all vehicles entering and exiting the site will be permanently recorded.

Supervision of tipping face

To ensure the accountability of those attempting to deposit non-authorised wastes into the landfill, tipping activities at the tipping face would be monitored whenever a delivery vehicle is present.

Any unacceptable material detected during supervision would be reloaded to the vehicles for removal by the driver and the incident recorded. If the unacceptable waste is detected after the vehicle has left, it would be separated from the tipping area by the operator and subsequently removed from the site. If the transporter of the material is known, it would be reloaded on the next visit to the facility of that transporter.

Should contaminated or hazardous material be detected on site, the area affected will be isolated until the material is contained by the Hazmat Response Team. The material would then be removed to an approved and licensed facility.

5.9.4 Landfill process and cover requirements

In practice the landform development will be continuous with many sub-stages. Waste would be placed within each sub-stage area and raised to the final level progressively.

Waste will be tipped in a defined filling area which may vary from day to day. Staff will restrict the tipping face to about 600 metres^2 (e.g. 30 x 20 metres) , depending on the level of demand and where health and safety considerations allow.

Deposited waste will be progressively consolidated and compacted in layers of about 500 millimetres depth, using a wheeled compactor. Layers of compacted waste will be built up during the day's operations to a maximum depth of two metres.

As required by the Guidelines, waste would be covered daily and at intermediate stages of operation to minimise odour, dust, litter, the presence of scavengers and vermin, the risk of fire, rainwater infiltration into the waste (and therefore the amount of leachate generated) and the emission of landfill gas.

Daily cover would comprise natural site soils and would be applied at a minimum thickness of 150 millimetres. Existing daily cover is sourced from clay stockpiled from the Stage E landfill excavation. During filling of Stages 1 and 2, a clay deficit is expected for each stage, however clay stockpiled from Stage E will be available for daily cover during filling of Stages 1 and 2. For Stage 3, sufficient clay is expected to be available for daily cover from the landfill excavation (see Section 5.1.6 for details of the earthworks and materials balance for the Proposal).

As progressive sub-stages are added, the temporary downstream batter may be excavated and the soil used as daily cover so that there will be no impediment to the lateral movement of leachate over the long-term.

As progressive lifts of waste are added to previously placed and compacted waste, the cover is stripped away in advance of filling over at least 50 percent of the area to be filled (on a daily basis) to allow for long-term vertical movement of leachate.

An intermediate cover of 300 millimetres will be applied to surfaces which will be unused for a period of 90 days or more. The intermediate cover will be compacted to reach a saturated hydraulic conductivity of less than 1x10-5 m/s with a compaction of 95 percent standard maximum dry density (SMDD).

Cover material will be sourced from excess excavated material from landfill cells. A detailed methodology for the covering of waste is provided in PMHC's *Solid Waste - Management Policies, Standard Operating Procedures and Safe Work Method Statements* (PMHC, 2013).

Covered sections of the landfill will be graded to drain rainfall runoff away from the tipping face. A small bund of excavated material will be maintained on the low side of the tipping face to collect and retain any runoff resulting from rainfall onto exposed

waste. Runoff collected in this manner is referred to as operational leachate and will either percolate through the cover material into the landfill, or evaporate.

The cover material previously placed over the underlying layer of waste will be bladed off to expose the waste such that the newly placed waste is in direct contact with the old waste. The cover will be removed by an excavator or similar equipment. Care will be taken to prevent disturbance of waste under the cover material and avoid mixing of waste with cover which is removed and stockpiled for later use. This practice encourages vertical rather than horizontal drainage within the landfill. Excess liquid will flow to the base of the landfill to be collected by the leachate collection system.

Sections of the landfill will be raised in steps so that access gradients are manageable for tipping vehicles.

The final landform is discussed in Section 5.10.4. A 'typical' development sequence is detailed in Table 5-1.

5.9.5 Asbestos disposal management

Asbestos is currently, and would continue to be, received and disposed of to landfill in accordance with the requirements of PMHCs SOP's Manual (PMHC, 2013) (Appendix F). The procedures contain a range of SOPs, including SOP 2 which specifies requirements for the safe handling of asbestos during disposal at the Proposal Site. SOP 2 incorporates precautions such as double sealing the waste in heavy duty plastic bags, inspection of the loads by staff, depositing the waste in a designated area, use of water carts when dealing with friable asbestos and minimising the number of people in the vicinity of the asbestos disposal activity.

5.9.6 Workforce, opening hours, management hours

No change is proposed to the current workforce and operating/management hours. It is anticipated that five full-time equivalent staff[13] would continue to be required on-site to manage the landfill operations including:

- Weighbridge attendant x 2
- Landfill supervisor x 1
- Machinery operator x 2.

The landfill is open every day, with the exception of Good Friday, Sunday and Christmas Day, and would continue to operate during the following hours:

- Monday to Friday: 7am - 5pm
- Saturday, Public holidays: 8am - 4pm.

Site management activities, such as final covering operations, may continue one hour after closure.

5.9.7 Vehicles, plant and equipment

A range of mobile vehicles, plant and equipment will be used on the site. Table 5-3 provides a list of indicative equipment and their likely uses however this is subject to change over the course of operations. The table also provides an indication of the hours of use for this equipment. Traffic generation due to the Proposal is discussed further in Section 8.8.

[13] Five full time equivalent staff would equate to approximately 12 individuals.

Table 5-3 Plant and equipment

Type	Model	Size	No. on site	Used for	% of manage - ment hours in use (in 2020)	% of manage - ment hours in use (in 2040)	% of manage - ment hours in use (in 2056)
Boggy tipper	Mack	12 t	1	Excavation	30	70	90
Diesel compactor	TANA	380	1	Waste compaction	30	70	90
Excavator	Kamatsu PC 200	20 t	2	Excavation	30	70	90
Single cab diesel ute	Ford Ranger	1.9 t	2	Fuel for excavator and compactor	10	20	30
Diesel pump	Hatz	1D5OZ	2	Leachate manageme nt	20	40	60
Diesel pump	Ruggeri ni	MD 191	1	Pumping water into water cart at dam.	10	20	30
Water cart	Rapid Spray	2500 L	1	Dust suppression	10	20	30

5.9.8 Services

No services (e.g. electricity, telephone, water or wastewater connections) are to be installed as part of the Proposal. These services are available within the broader Cairncross WMF and are managed by the operators of those facilities.

5.9.9 Management of koala connectivity corridor

The Koala connectivity corridor will be managed to encourage use by native species, specifically Koalas. Management for this area would be incorporated into the OEMP to be prepared for the Cairncross WMF. The management activities would cover the following requirements:

- Initial and ongoing weed removal
- Pest animal control measures (including monitoring and trapping where necessary)
- Planting of supplementary trees and shrubs to improve the habitat value of the corridor, if required, as determined by a qualified ecologist
- The suitability of bushfire control measures to be undertaken within the corridor
- Litter removal/removal of illegally dumped rubbish.

5.9.10 Environmental monitoring

A program of environmental monitoring would be undertaken for the Proposal including stormwater, groundwater, leachate and landfill gas monitoring. The monitoring requirements are discussed in Sections 8.3, 8.4, 8.5 and 8.9.

5.9.11 Managing litter and preventing illegal dumping

Preventing illegal dumping on the access road, and reducing litter (both within the site and adjacent areas), will be a key focus of the OEMP governing the Proposal. The existing OEMP for the site includes litter control strategies and PMHC commenced a general illegal dumping program in early 2015, working in partnership with National Parks and Wildlife Services and Forests NSW as stakeholders, to help address this issue.

PMHC finalised two Memorandum of Understandings (MOUs) with NPWS and Forestry Corporation of NSW. In the MOUs, PMHC committed to a coordinated partnership approach to managing illegal dumping. Some of the key actions relevant to this Proposal include:

- Strengthening community understanding of illegal dumping issues through community education programs
- Participating in regional planning and illegal dumping projects
- Providing support for investigation, surveillance and follow up by PMHCs Compliance team
- Clean up of areas around the Cairncross WMF.

5.10 Site closure

The following section describes the final capping and revegetation program for the Cairncross WMF landfill as well as the landfill closure plan including the final landform and long-term monitoring and management plans post-closure of the landfill.

5.10.1 Landfill Closure Plan

The Guidelines require that the landfill be non-polluting and not cause environmental harm after site closure. A Landfill Closure Plan will be prepared and submitted to the EPA for approval no later than 12 months before the completion of the landfill's waste receipt operations. The Landfill Closure Plan will specify:

- The measures to be implemented when closing and stabilising the landfill
- The timeframe for implementation of these measures
- The design and construction quality requirements for the final capping
- Post-closure management and monitoring measures for leachate, stormwater, landfill gas, odour, dust, litter and final cap integrity
- Identify any proposed future use of the site
- Be consistent with all applicable conditions of the development consent
- Ensure neighbouring residents are advised of the contact persons for discussing any problems (e.g. odour emissions)
- Ensure waste is not received for disposal at the site after landfill operations cease.

Potential future long-term land use options would be investigated approximately five to 10 years prior to the landfill reaching capacity to enable sufficient lead time to secure any necessary planning approvals.

5.10.2 **Rehabilitation overview**

The operational practices to be implemented for the Proposal would ensure that rehabilitation and restoration occurs in a progressive manner as each landfill cell reaches capacity. Progressive rehabilitation undertaken throughout the life of the Proposal will reduce impacts on the Proposal Site and surrounding areas. Proposed rehabilitation activities will include: implementation of the proposed final landform; capping and revegetation; and post closure monitoring and management. These rehabilitation activities will provide the following:

- A barrier to the migration of water into the waste mass, therefore reducing the amount of leachate generated and the potential for contamination of groundwater
- Surface water runoff from the landform designed to minimise unacceptable erosion or further potential environmental impacts
- A long-term stable barrier between waste and the environment in order to protect human health and the environment
- Stability of the proposed landfill to limit potential erosion and dust
- Visual integration with the surrounding area.

5.10.3 **Capping and revegetation**

All completed landfill cells will be capped and revegetated in accordance with the Guidelines and within six months of the final delivery of waste to the cell. The final capping and revegetation will ensure the long-term concealment of the landfill.

Capping details

The final landfill cap is to be constructed in accordance with the Guidelines, and is to comprise the following:

- 300 millimetres thick seal bearing surface (compacted clay)
- 600 millimetres thick composite sealing layer of (compacted clay hydraulic conductivity $<1x10^{-9}$ m/s).

Figure 5-6 details the staged landfilling approach to be used at the Proposal Site. This staging will allow for the progressive excavation and capping of the previous sub-stage while the current sub-stage is being filled. A ‘typical’ development sequence is detailed in Table 5-1. Figure 5-10 shows the final capping/landform levels.

Material volume calculations estimate sufficient capping material for Stages 1, 2 and 3 (refer to Table 5-2 for details on the overall site material balance).

Revegetation

A revegetation layer is to be placed over the clay capping layer and will be in accordance with the Guidelines. The revegetation layer will be 1,000 millimetres thick, comprising 700 millimetres clay (lower) and 300 millimetres topsoil (upper). Revegetation is to comprise grass cover of suitable native species.

Revegetation and rehabilitation will be undertaken at the site once the landfill has reached capacity.

5.10.4 **Final landform**

The final landform for the Cairncross WMF, presented in the *Cairncross Waste Management Facility Landfill Environment Management Plan* (LEMP) (2001) and 2008 OEMP, has been reviewed and generally adopted for the Proposal as it maintains a similar profile to the surrounding landscape and is lower than the

surrounding tree top canopy ensuring the landfill continues to be screened. The final landform levels are presented in Figure 5-12.

The following slope criteria were used to refine the final landform design:

- Maximum finished landform slope of 1V:4H to allow maintenance (mowing) of finished surface after capping.
- Minimum finished landform slope of 1V:25H (four percent grade) to ensure rainfall sheds from the surface and does not infiltrate the landfill.
- A temporary batter of 1V:4H will be used between stages to ensure leachate and waste is contained appropriately and to limit the use of excess fill.

The final landform design will allow for access around the entire site perimeter and to the landform summit for groundwater monitoring, site inspection, maintenance, and bushfire protection. Justification for the proposed final landform is based on minimising environmental impacts and ensuring appropriate ongoing management of the site.

The Proposal Site would be maintained as a vacant site post closure and rehabilitation (i.e. no active use of the site, such as golf courses or redevelopment, is proposed at this stage). The site is not included in any future land release or rezoning investigation areas. There are no future plans for development on the site.

5.11 Capital investment value

The CIV for the Proposal, consistent with the definition provided in the EP&A Regs, is approximately $57 M Australian Dollars (AUD) (excluding GST) (refer to the Quantity Surveyor's Report prepared by WT Partnership (Appendix D).

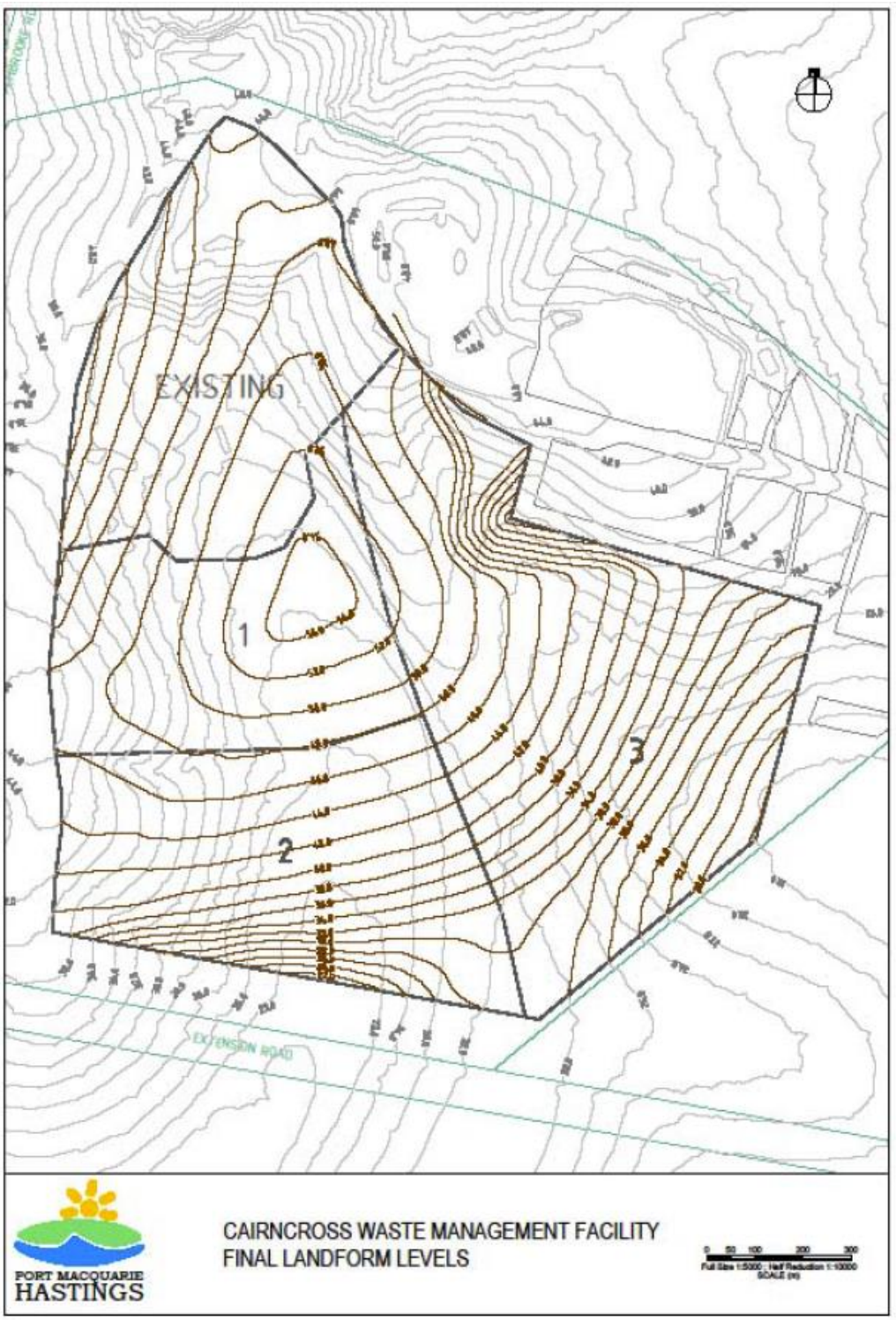


Figure 5-12 Final Landform Levels

6 STATUTORY PLANNING AND APPROVALS

The following sections outline the planning assessment process that is applicable to the Proposal and summarises relevant environmental planning legislation and plans which have been taken into consideration during preparation of this EIS.

6.1 Existing approvals

As discussed in Section 2.3, the Cairncross WMF comprises a number of operations including the existing landfill, ORRF, MRF, WTS and an inert waste (concrete and brick) processing area. These operations are currently subject to several development approvals including:

- DA No. 1999/178: this consent was granted under Part 4 of the EP&A Act for the establishment and operation of an extractive industry. This consent applies to the construction and operation of Stage E of the landfill only. The recent amendment to this DA permits the operation of the landfill until 2026 or until the Stage E landfill is full (Cl. 4). The landfill is operated by PMHC.
- DA No. 2000/0582: this consent applies to construction of 'structures for waste management facility', and includes the gatehouse and weighbridge station, vehicular storage facility and the local transfer station. These facilities are operated by PMHC.
- DA No. 2000/0833: this consent applies to the construction and operation of the ORRF. The ORRF is operated by a contractor engaged by PMHC.
- DA No. 2005/531: this consent is for the extension of the MRF and includes conditions for the construction of the extension of the MRF and for operation of the facility as a whole. The MRF is operated by a contractor engaged by PMHC.
- DA No. 2013/659: this consent is for the construction of building pads, upgrade of access road to service building pads, and extension of services (water, power, telecom, sewer).

Approval under Part 5 of the EP&A Act was granted for the establishment and operation of the Cairncross WMF on 26 July 1999. Clause 5 of the approval restricts the approval to operation of Stage E of the landfill only, and for an operational life of 20 years. While the consent states it is applicable to the landfill only, reference to the proposal as a 'waste management facility' indicates that the approval is also for the operation of the ORRF, MRF and WTS, as identified in the 1999 EIS. The Part 5 approval was amended in October 2013, with a REF prepared to support the amendment. The amendment permits the operation of the landfill until 2026 or until Stage E of the landfill is full.

An REF was prepared by ERM for the construction and operation of the ORRF in 2000. The REF supported approval of the ORRF under Part 4 of the EP&A Act.

6.2 Commonwealth legislation

6.2.1 Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places and control certain actions - defined in the EPBC Act as Matters of National Environmental Significance (MNES). The MNES that are protected under the EPBC Act are:

- World heritage properties

- National heritage places
- Wetlands of international importance
- Listed threatened species and ecological communities
- Migratory species
- Commonwealth marine areas
- The Great Barrier Reef National Park
- Nuclear actions (including uranium mines)
- An action on Commonwealth land which is likely to have a significant impact on the environment
- Coal seam gas activities that pose risk to water resources.

In accordance with Section 67 and 67A of the EPBC Act, any works that have the potential to result in an impact on any MNES are considered 'controlled actions' and would require a referral to the Federal Minister for the Environment for approval.

A search of the EPBC Protected Matters Search tool was undertaken on 18 February 2016 for the site and a surrounding 10 kilometre buffer. An overview of findings is presented in Table 6-1.

Table 6-1 EPBC Protected Matters Summary

Matters of National Environmental Significance	Assessment
Wetlands of International Importance (RAMSAR)	No wetlands of international importance are located within the vicinity of the Proposal site.
World Heritage Properties	No World Heritage Properties are located within the vicinity of the Proposal site.
National Heritage Places	No National Heritage Places are located within the vicinity of the Proposal site.
Commonwealth Marine Areas	No Commonwealth Marine areas are located within the vicinity of the Proposal site.
Listed Ecological Communities	Two listed threatened ecological communities are likely to occur within 10 km of the Proposal site, however the Biodiversity Assessment undertaken confirmed that these communities are not present on the site and would not be impacted by the Proposal. The Biodiversity assessment is summarised in Section 8.2
Listed Threatened Species and Listed Migratory Species	46 Threatened Species and 41 Migratory Species were identified in the search as potentially occurring or with potential habitat within 10km of the Proposal site. The Biodiversity Assessment of the Proposal Site concluded the Proposal would not result in a significant impact on EPBC listed threatened or migratory species. Further detail is provided in the Flora and Fauna assessment in Section 8.2.
Commonwealth Land	There is no Commonwealth land within the Proposal Site.

As the Proposal, would not have a significant impact on any MNES, referral to the Federal Minister for the Environment for approval under the EPBC Act is not required.

6.3 NSW legislation

6.3.1 Environmental Planning and Assessment Act 1979

The *Environmental Planning and Assessment Act 1979* (EP&A Act) and the *Environmental Planning and Assessment Regulation 2000* (EP&A Regs) provide the framework for the assessment of the environmental impact of proposed development in NSW.

The objectives of the EP&A Act include:

> *(a) the encouragement of:*
>
> *i) the proper management, development, and conservation of natural and artificial resources…*
>
> *ii) the promotion and coordination of the orderly and economic use and development of land…*
>
> *vi) the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats;*
>
> *iv) ecologically sustainable development…*
>
> *(c) to provide increased opportunity for public involvement and participation in environmental planning and assessment.*

Part 3 of the EP&A Act provides for the formation of Environmental Planning Instruments (EPIs), which can take the form of Local Environmental Plans (LEPs) or State Environmental Planning Policies (SEPPs). EPIs contain provisions that control the permissibility of development and identify when development approval is required. EPIs that are applicable to the Proposal are:

- *State Environmental Planning Policy (Infrastructure) 2007* (ISEPP)
- *State and Environmental Planning Policy (State and Regional Development) 2011* (SEPP S&RD)
- *State Environmental Planning Policy No. 14 (Coastal Wetlands)* (SEPP 14)
- *State Environmental Planning Policy No. 33 - Hazardous and Offensive Development* (SEPP 33)
- *State Environmental Planning Policy No. 44 – Koala Habitat Protection* (SEPP 44)
- *State Environmental Planning Policy No. 55 – Remediation of Land* (SEPP 55)
- *State Environmental Planning Policy No.64 – Advertising and Signage* (SEPP 64)
- *Port Macquarie-Hastings Local Environment Plan 2011* (PMHC LEP).

Part 4 of the EP&A Act establishes the classification of development as permissible without consent, permissible with consent and prohibited, and the requirements for assessment of development that is permissible with consent. The permissibility and the planning assessment process for the Proposal are determined by the EPIs applicable to the Proposal site. These are discussed in more detail in Section 6.3.12 and 6.3.13.

Within Part 4 of the EP&A Act there are a number of potential approval pathways for development that requires consent. These include:

- Development that requires development consent (and a DA) under an EPI; or
- Development that requires development consent (and a DA), however is of a nature that is considered 'designated development' under section 80 of the EP&A Act. Development that is 'designated development' is identified under Schedule 3 of the EP&A Regs; or
- Development that requires development consent (and a DA) however is of a nature that is considered 'state significant development' under Part 4, Division 4.1 of the EP&A Act. Development that is 'state significant development' is identified under the SEPP S&RD.

The Proposal is considered to be 'State Significant Development' as it is of a type listed in Schedule 1 of the State and Regional Development SEPP (refer to Section 6.3.12). In accordance with Section 89E of the EP&A Act, the Minister for Planning is the consent authority for State Significant Development. As such the NSW Minister for Planning is the consent authority for the Proposal and a development application is required to be lodged with the NSW DPE and, pursuant to Clause 8A of Section 78A of the EP&A Act, accompanied by an EIS.

6.3.2 Environmental Planning and Assessment Regulation 2000

Clauses 6 and 7 of Schedule 2 of the EP&A Regs prescribe the form and content requirements for environmental impact statements. The SEARs specify that the EIS must meets these requirements. This EIS has been prepared pursuant to these requirements, as detailed in Section 1.5 and the Statement of Validity.

6.3.3 Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations Act* 1997 (POEO Act) is the key piece of environmental protection legislation administered by the Environment Protection Authority (EPA). The principle objectives of the POEO Act are to:

- Protect, restore and enhance the quality of the environment, while having regard to the principles of ecologically sustainable development (ESD).
- Provide increased opportunities for public involvement and participation in environment protection.
- Reduce risks to human health and prevent the degradation of the environment.
- Assist in the achievement of the objectives of the WARR Act.

Protection of the Environment (Waste) Regulation 2014

The *Protection of the Environment (Waste) Regulation* 2014 (POEO Waste Regulation), came into effect on 1 November 2014. The POEO Waste Regulation introduced a number of changes to the regulatory environment for waste management in NSW.

The new regulations have reduced the volumes of waste that may be handled at resource recovery facilities and waste storage facilities without an EPL on a daily basis to 1,000 tonnes per day and on an annual basis to 6,000 tonnes per annum (within the regulated area), respectively. The volumes of waste handled on the Proposal Site would exceed these licensing thresholds and therefore operation of the site would need to be in compliance with an EPL issued by the EPA.

The Cairncross WMF is currently subject to EPL 11189 and PMHC would seek a modification to this EPL, where required, to incorporate the construction and operation of the Proposal.

6.3.4 Contaminated Land Management Act 1997

The general object of the *Contaminated Land Management Act 1997* (CLM Act) is to establish a process for investigating and (where appropriate) remediating land that the EPA considers to be contaminated significantly enough to require regulation.

Section 5 of the CLM Act defines 'contamination' of land as meaning: the presence in, on or under the land of a substance at a concentration above the concentration at which the substance is normally present in, on or under (respectively) land in the same locality, being a presence that presents a risk of harm to human health or any other aspect of the environment.

As the Proposal Site is located immediately adjacent to and downgradient of the Stage E landfill, there is the potential for soils at the Proposal Site to have become contaminated from transport of leachate from the Stage E area. However, groundwater monitoring for Stage E has shown that there is presently no mixing of leachate with groundwater at the site (Trace Environmental, 2016). Therefore, the potential for any soil contamination impacts from the Stage E landfill on the Proposal Site is predicted to be low.

A search of the *NSW Contaminated Land Public Record* (NSW EPA, 2017a) found no records of contaminated sites within the PMHC LGA (see Appendix L). A search of the *List of NSW Contaminated Sites Notified to EPA* (undertaken 16 March 2017) (NSW EPA, 2017b) (Appendix N) identified 11 contaminated sites within the PMHC LGA. The majority of these sites were petrol stations and none of the sites is within, adjacent to or within close proximity of the Proposal Site.

A search of the NSW EPA POEO Act public register of licence, applications and notices was undertaken on 17 March 2017 for Telegraph Point, NSW. The search results listed 10 entries, all of which relate to the Cairncross WMF EPL (initial issue of EPL and subsequent variations) (Appendix M).

The potential for unexpected finds of contaminated materials, and related management processes, is discussed in Section 8.3.

6.3.5 Heritage Act 1977

The *Heritage Act 1977* (Heritage Act) aims to identify and conserve items of local and state historical significance. This can be in relation to a building, work, relic, moveable object or precinct and significant in relation to the historical, scientific, cultural, social, archaeological, architectural, natural or aesthetic value of the place or item. The Heritage Act informs the State Heritage Register which lists places and items of particular importance to the state. Items are added to the State Heritage Register on the recommendation of the Heritage Council.

Under the Heritage Act and the EP&A Act it is illegal to cause harm to items identified on the State Heritage Register or to disturb or excavate land where the disturbance or excavation would or is likely to result in a relic being discovered, exposed, moved, damaged or destroyed without the approval of the NSW Heritage Council.

An interrogation of publicly available local, state and national heritage databases (including the Port Macquarie-Hastings LEP, OEH State Heritage Register and EPBC Protected Matters Search Tool), revealed that no items of local, state or national heritage significance are located on the Proposal Site. Notwithstanding this finding, one locally significant heritage conservation item ('Timber mill') is located within one kilometre of the Proposal Site. Due to the distance between the Proposal Site and the

nearest heritage item, no direct, physical impacts are expected to occur during construction or operation.

Details of the potential heritage impacts and mitigation strategies are outlined in Section 8.10 and 8.11.

6.3.6 National Parks and Wildlife Act 1974

The objectives of the *National Parks and Wildlife Act 1974* (NP&W Act) are to conserve nature, objects, places or features of cultural value within the landscape including but not limited to:

- Places, objects and features of significance to Aboriginal people
- Places of social value to the people of NSW
- Places of historic, architectural or scientific significance.

The NP&W Act also aims to foster public appreciation of nature and cultural heritage and provide for management of land reserved under the NP&W Act. Areas protected by the NP&W Act are managed by the NPWS to conserve the area. The Rawdon Creek Nature Reserve, which borders the southeast of the CMWF, is reserved and managed under the NP&W Act. Assessments including biodiversity, soil, water and leachate were conducted to determine the potential impacts on areas surrounding the Proposal. A summary of the findings is provided in Sections 8.2, to 8.4.

Under Section 85 of the NP&W Act, the Director General (DG) of the OEH has the authority for the protection of Aboriginal objects and Aboriginal places in NSW. Under the NP&W Act it is illegal to impact or cause the destruction of Aboriginal objects, including for the purposes of investigations, without an Aboriginal Heritage Impact Permit (Section 90, NP&W Act and Section 89J EP&A Act).

An Aboriginal heritage due diligence assessment was undertaken by Adise and concluded that two Aboriginal sites with a low-level of archaeological potential will be destroyed during the construction of the Proposal. It is noted that an Aboriginal Heritage Impact Permit (AHIP) under section 90 of the NP&W Act 1974 is not required for SSD that is authorised by a development consent. The findings are documented in Section 8.10.

6.3.7 Rural Fires Act 1997

The objectives of the *Rural Fires Act 1997* are to provide for:

- The prevention, mitigation and suppression of bush and other fires in local government areas (or parts of areas) and other parts of the State constituted as rural fires districts
- Coordination of bush firefighting and bush fire prevention throughout the State
- Protection of persons from injury or death and property from damage arising from fires
- Protection of infrastructure and environmental, economic, cultural, agricultural and community assets from damage arising from fires
- The protection of the environment by requiring the above-listed activities to be carried out having regard to the principles of ESD.

Section 63 of the Rural Fires Act places a ‘duty of care’ on all land owners to prevent a fire spreading on or from their land. This duty is applicable to the Proposal Site as it places an onus on PMHC to provide and maintain appropriate setbacks and/or landscaping around the Proposal Site to minimise the potential bushfire risk.

A bushfire assessment has been undertaken to determine compliance of the Proposal with *Planning for Bushfire Protection* (NSW RFS, 2006). A summary of the

assessment and the associated mitigation measures that would be adopted on the site is provided in Section 8.13.

6.3.8 Threatened Species Conservation Act 1995

The *Threatened Species Conservation Act 1995* (TSC Act) sets out provisions for planning and assessment of impacts on threatened species, populations and ecological communities listed under schedules 1, 1A and 2 of the TSC Act. The purpose of the TSC Act is to:

- Conserve biological diversity and promote ESD
- Prevent the extinction and promote the recovery of threatened species, populations and ecological communities
- Protect the critical habitat of those species, populations and ecological communities that are endangered
- Eliminate or manage certain processes that threaten the survival or evolutionary development of threatened species, populations and ecological communities
- Ensure that the impact of any action affecting threatened species, populations and ecological communities is properly assessed
- Encourage the conservation of threatened species, populations and ecological communities through co-operative management.

The TSC Act lists a number of factors to be taken into account in deciding whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats. Schedules 1 and 2 of the TSC Act lists species, populations or ecological communities of native flora and fauna considered to be threatened in NSW. DAs and environmental assessments which need consent are required to be assessed with regard to the purpose of the TSC Act and consideration given to the significance of any impact on listed species.

A Biodiversity Assessment has been undertaken, and the results are summarised in Section 8.2.

6.3.9 Noxious Weeds Act 1993

The *Noxious Weeds Act 1993* aims to reduce the negative impact of weeds on the economy, community and the environment by providing for the effective management and monitoring of widespread weeds. The objective of the *Noxious Weeds Act 1993* is to reduce the impact of weeds and prevent the establishment of further weed populations. To achieve this, the *Noxious Weeds Act 1993* imposes obligations on occupiers of land to control any noxious weeds that have been declared within their area.

A discussion of weed species present on the Proposal Site and management strategies for the control of weeds is provided in Section 8.2.

6.3.10 Waste Avoidance and Resource Recovery Act 2001

The *Waste Avoidance and Resource Recovery Act 2001* (WARR Act) aims to encourage the most efficient use of resources to reduce environmental harm and ensure that resource management is undertaken in a logical, sustainable and organised manner. The WARR Act promotes the preparation of a waste strategy for the state by the DG and aims to improve the responsibility for waste reduction in the industry.

As discussed in Section 3.3, the Proposal is consistent with the waste management and recovery principles provided in state, regional and local waste strategies.

6.3.11 **Water Management Act 2000**

The object of the *Water Management Act 2000* (WM Act) is to provide for the sustainable and integrated management of the water sources of the State for the benefit of both present and future generations. The WM Act provides for the preparation of water sharing plans that set extraction limits and rules for water access, available water determinations, account management and trading in order to protect surface water and groundwater sources and their dependent ecosystems, whilst recognising the social and economic benefits of the sustainable and efficient use of water. The Proposal is located within the New England Fold Belt Coast Groundwater Source under the *Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016* (the Water Sharing Plan). The New England Fold Belt Coast includes all water below the surface of the ground. Licences under the WM Act are required for interception of any aquifer underlying the landfill and for groundwater extraction.

The Proposal has been designed to have a minimal impact on the quality and quantity of water discharged from the site, and to minimise the demand for potable water at the site through the capture and reuse of rainwater. Further details on proposed water management at the site are provided in Section 8.4.

Under the WM Act, approval is required to undertake the following:

- Controlled activities, including dredging and reclamation works and any works that affect the quantity or flow of water in a water source; or
- Aquifer interference activities, including any activity involving the penetration of an aquifer, interference with water in an aquifer and obstruction of water within an aquifer.

Under section 91F of the WM Act, it is an offence to carry out an activity that would interfere with water within an aquifer, causing removal of water from the source or the movement of water from one part of an aquifer to another without an aquifer interference approval. The NSW Aquifer Interference Policy (NSW AIP) specifies the requirements for assessing the impacts of aquifer interference activities on water resources. All construction works associated with the Proposal meet the requirements specified by the NSW AIP therefore an aquifer interference approval is not required.

Under section 60D of the WM Act, it is an offence to take water from a water source by means other than by a water supply work without a water licence. A water licence is required whether water is taken for consumptive use or whether it is taken incidentally by the aquifer interference activity. It is anticipated the Proposal would intercept groundwater during excavation and seepage may occur into the cell.

During the development of Stages 1 to 3 most water used on site would be harvested from rainwater. The Proposal will however intercept groundwater during periods of maximum groundwater heads in Stages 1 and 2 during excavation. This may result in groundwater inflow into the base of the excavated area at a maximum rate of 0.44ML/year and 0.53 ML/year for stages 1 and 2, respectively during construction. Negligible groundwater inflow is expected during excavation of Stage 3 and operation of all stages. In accordance with the Water Sharing Plan, the predicted groundwater interception may need to be licenced and entitlements purchased, as regulated by applicable the Water Sharing Plan.

Further information about potential surface and ground water impacts is provided in Section 8.4.

6.3.12 **State environmental planning policies**

State Environmental Planning Policy (State and Regional Development) 2011

State Environmental Planning Policy (State and Regional Development) 2011 identifies classes of development and determines whether a development is classified as SSD under Section 4 of the EP&A Act. This SEPP identifies the thresholds for waste and resource management facilities, along with other development types, to be classified as SSD.

The aims of SEPP *(State and Regional Development)* 2011 are to:

- Identify development that is SSD
- Identify development that is State Significant Infrastructure and critical State Significant Infrastructure.
- Confer functions on joint regional planning panels to determine development applications.

Under Clause 23, Schedule 1 of SEPP *(State and Regional Development)* 2011 the Proposal Site is considered to be:

> *development for the purpose of regional putrescible landfills that have capacity to receive over 650,000 tonnes of putrescible waste over the lifetime of the site.*

Stages 1-3 of the Proposal are expected to receive a total of approximately 3.2 million tonnes of waste over the life of the expanded landfill. Development is therefore classified as SSD and is assessable under Part 4, Division 4.1 of the EP&A Act. Any activities that are related to the Proposal are also assessable as SSD.

Under Clause 11 of SEPP S&RD, development control plans (DCPs), developed under LEPs, are not applicable to SSD. As such, any DCPs established under the Port Macquarie-Hastings LEP, are not applicable to the Proposal.

State Environmental Planning Policy (Infrastructure) 2007

The *State Environmental Planning Policy (Infrastructure) 2007* (ISEPP) aims to facilitate the effective delivery of infrastructure across NSW. The ISEPP specifies when development consent is, and is not, required for development to be carried out for certain types of development in certain zones.

Section 121 of the ISEPP facilitates development for the purposes of waste or resource management facilities to be undertaken, with development consent within a 'prescribed zone' (which includes rural zones RU1 Primary Production, RU2 Rural Landscape, IN1 General Industrial, IN3 Heavy Industrial, SP1 Special Activities and SP2 Infrastructure). As discussed further below, the Proposal site is zoned SP2 Waste or Resource Management Facility under the Port Macquarie-Hastings LEP and therefore is considered to be a 'prescribed zone'. As such, development of waste or resource management facilities is permissible on the Proposal Site, with development consent.

Analysis against clause 123 of ISEPP

Clause 123 of ISEPP outlines the issues a consent authority must consider when determining developments for the purpose of construction, operation or maintenance of a landfill for the disposal of waste. Table 6-2 outlines the matters for consideration outlined in Clause 123 of ISEPP and the responses with respect to the Proposal.

Table 6-2 Clause 123 of ISEPP Matters of Consideration

Matters for consideration	Response
(a) whether there is a suitable level of recovery of waste, such as by using alternative waste treatment or the composting of food and garden waste, so that the amount of waste is minimised before it is placed in the landfill	PMHC is currently achieving a kerbside diversion rate of 69.5 % and a C&I waste diversion rate of 18%. This is facilitated by a number of initiatives including the ORRF and MRF which form part of the broader Cairncross WMF. The Proposal would contribute to the minimisation of waste to landfill through the provision of a best practice landfill with operational procedures that support the diversion of unacceptable or reusable materials from the landfill. This would support an increase in recycling and diversion of waste from landfill by providing a facility that allows for improved separation of waste streams and diversion of recoverable materials to the adjacent ORRF and MRF. Further detail on PMHCs performance against waste diversion targets is included in Section 3.2.
(b) whether the development: *(i) adopts best practice landfill design and operation*	The design and operation of the landfill would adopt best practices and be consistent with the Guidelines. This is demonstrated through the Concept Design Report (PMHC, 2016). Key components of this are the proposed landfill cell liner and leachate collection system, as discussed further in Chapter 2. The Proposal would operate as one component of PMHCs broader waste management services which include a number of waste avoidance and minimisation strategies. The expansion of the landfill would complement the adjacent ORRF and MRF and provide a safe and reliable location for disposal of waste.
(ii) reduces the long term impacts of the disposal of waste, such as greenhouse gas emissions or the offsite impact of odours, by maximising landfill gas capture and energy recovery	The Proposal would reduce long term impacts of the disposal of waste by project planning to minimise vehicle movements, implementation of a landfill gas monitoring program, and development of a landfill gas management plan.
(c) if the development relates to a new or expanded landfill: *(i) whether the land on which the development is located is degraded land such as a disused mine site*	The Proposal is an extension of the existing Cairncross WMF. It is considered that the expansion along the southeast of the existing site will provide less environmental impact than the creation of a new landfill site. While the Proposal is located outside the existing approved landfill footprint, it would be located on land already utilised for landfill related operations. The suitability of the Proposal Site for landfilling was established in the 1999 EIS. Further details regarding the suitability of the Proposal Site are discussed in Chapter 2.

Matters for consideration	Response
(ii) whether the development is located so as to avoid land use conflicts, including whether it is consistent with any regional planning strategies or locational principles included in the publication EIS Guideline: Landfilling (Department of Planning, 1996), as in force from time to time,	The Proposal Site would be contained within the area originally identified for the Cairncross WMF in the 1999 EIS and appropriately zoned as SP2 – Waste or Resource Management Facility under the PMHC LEP (2011). It is therefore consistent with regional planning strategies or locational principles included in the publication EIS Guideline. As described in Section 2, the selection of the Cairncross WMF site in the 1999 EIS took into consideration a number of selection criteria regarding flooding, topography, geology and proximity to sensitive receivers. The Proposed land use is consistent with the land zoning and the Proposal Site is distant from sensitive receivers.
(d) whether transport links to the landfill are optimised to reduce the environmental and social impacts associated with transporting waste to the landfill.	As the Proposal Site is contained within the existing WMF, the Proposal will use the existing established access. As such, no new road infrastructure is required to provide access to the Proposal Site. The Proposal Site is located adjacent to the existing Pacific Highway that provides an efficient transport link to the landfill thus reducing impacts on local road networks. The traffic assessment found that the Proposal will result in additional landfill related traffic travelling on the road network however this increase, and associated impacts on the site intersection, would be offset by the significant reduction in through-traffic associated with the realignment of the Pacific Highway.

State Environmental Planning Policy No. 33 - Hazardous and Offensive Development

State Environmental Planning Policy No. 33 - Hazardous and Offensive Development (SEPP 33) links the safety and environmental performance of an industrial development proposal to its permissibility. Certain activities may involve handling, storing or processing a range of materials, which, in the absence of controls, may create risk outside of operational borders to people, property or the environment. Such activities will be defined by SEPP 33 as a 'potentially hazardous industry' or 'potentially offensive industry'. SEPP 33 applies to any industrial development proposals which fall within these definitions.

Under Clause 3, a development is deemed part of a “potentially hazardous industry” if it satisfies the definition:

> *“a development for the purposes of any industry which, if the development were to operate without employing any measures (including, for example, isolation from existing or likely future development on other land) to reduce or minimise its impact in the locality or on the existing or likely future development on other land, will pose a significant risk in relation to the locality*:

a) to human health, life or property, or;
b) to the biophysical environment;
and includes a hazardous industry and a hazardous storage establishment."

The DPE (2011) guideline *Applying SEPP 33* provides a risk screening procedure to facilitate determination of whether a proposed development is assessable under SEPP 33. If, under this screening test SEPP 33 is triggered, Clause 12 of SEPP 33 requires that any proposal to carry out a potentially hazardous development must be supported by a Preliminary Hazard Analysis (PHA).

A 'potentially offensive industry' is one which, in the absence of any safeguards and mitigation measures, emits a polluting discharge in a manner which would have a significant adverse impact.

Industries or proposed developments which require an EPL would suggest the proposed developments are potentially offensive and therefore require the limits prescribed by the aforementioned EPL. However, the issuance of an EPL to a proposed development would indicate the EPA does not consider it to be an 'offensive industry' while operating within the restrictions specified in the conditions of the EPL.

As discussed above, the Cairncross WMF is currently subject to EPL 11189 and PMHC would seek a modification to this EPL, where required, to incorporate the construction and operation of the Proposal. As the Proposal has the potential to pose environmental, human health, and amenity hazards (if it were to operate without any measures to reduce or minimise its impact in the locality) a screening assessment was undertaken, which is outlined in Section 8.13. The assessment found the Proposal would not trigger the need for a PHA as it would operate below the screening levels set out in the guideline *Applying SEPP 33.*

State Environmental Planning Policy No. 44 - Koala Habitat Protection

State Environmental Planning Policy No. 44 – Koala Habitat Protection (SEPP 44) aims to encourage conservation of areas of natural vegetation that provide habitat for koalas. This is achieved by identifying and managing development within areas of core, or potential, koala habitat.

SEPP 44 applies to land in relation to which a DA has been made and which has an area of more than one hectare. This Proposal Site fulfils both of these criteria. If the land is identified as potential koala habitat under Part 2 of SEPP 44, further procedures must be carried out to determine whether the land constitutes 'potential' or 'core' koala habitat. Core koala habitat is defined as areas which contain a resident koala population and potential koala habitat is defined as areas of native vegetation where the trees of the types listed in Schedule 2 constitute at least 15 percent of the total number of trees in the upper or lower strata of the tree component. Should core habitat be identified, a plan of management must be prepared and any consent granted must be consistent with the plan of management.

An assessment of the flora and fauna present on the Proposal Site and the potential impacts on biodiversity associated with the Proposal has be undertaken. The outcomes of the assessment are presented in Section 8.2.

State Environmental Planning Policy No. 55 - Remediation of Land

The objective of *State Environmental Planning Policy No. 55 – Remediation of Land* (SEPP 55) is to provide for a coordinated state-wide planning approach for the remediation of contaminated land. SEPP 55 aims to promote the remediation of contaminated land with the objective of reducing the risk of harm to human health or other aspects of the environment.

Clause 7 of SEPP 55 requires the approval authority have regard to certain matters before granting approval. These matters include:

- Whether the land is contaminated
- Whether the land is, or will be, suitable for the purpose for which development is to be carried out
- If remediation is required for the land to be suitable for the proposed purpose, whether the land will be remediated before the land is used for that purpose.

SEPP 55 also imposes obligations to carry out any remediation work in accordance with relevant guidelines, developed under the *Contaminated Lands Management Act 1997* (CLM Act) (discussed further below) and to notify the relevant council of certain matters in relation to any remediation work.

A preliminary contamination assessment has been prepared for the Proposal and found that with the implementation of best practice procedures the potential for contamination is considered to be low.

A desktop contamination review found the following:

- A search of the *NSW Contaminated Land Public Record* (NSW EPA, 2017a) found no records of contaminated sites within the PMHC LGA (see Appendix L)
- A search of the *List of NSW Contaminated Sites Notified to EPA* (NSW EPA, 2017b) (Appendix N) identified 11 contaminated sites within the PMHC LGA. The majority of these sites were petrol stations and none of the sites is within, adjacent to or within close proximity of the Proposal Site\
- A search of the NSW EPA POEO Act public register of licence, applications and notices was undertaken for Telegraph Point, NSW. The search results listed 10 entries, all of which relate to the Cairncross WMF EPL (initial issue of EPL and subsequent variations) (Appendix M).

6.3.13 Local environmental plans and development control plans

PMHC Local Environment Plan 2011

The *PMHC Local Environment Plan 2011* (PMHC LEP) came into force on 23 February 2011. The Proposal Site is located within an area of the PMHC LGA and the PMHC LEP is therefore applicable to the Proposal Site. The aims of the PMHC LEP are to:

(a) to protect, conserve and sustainably manage the ecological biodiversity and natural environment of the Port Macquarie-Hastings area,

(b) to facilitate a strong and diverse local economy within the Port Macquarie-Hastings area,

(c) to manage and coordinate the orderly, equitable and economic use and development of land within the Port Macquarie-Hastings area,

(d) to facilitate the provision and coordination of community services and facilities within the Port Macquarie-Hastings area,

(e) to facilitate adaptive planning for natural hazards and risks, including flooding, erosion, inundation, land stability, bush fire risk and acid sulfate soils within the Port Macquarie-Hastings area,

(f) to reinforce the role of the Port Macquarie-Hastings area's settlement hierarchy, centred on Port Macquarie and supported by its surrounding towns and villages,

(g) to ensure the effective management of public assets within the Port Macquarie-Hastings area,

(h) to provide a land use framework for development within the Port Macquarie-Hastings area that is safe, inclusive and equitable, and caters for the housing, employment, entertainment, cultural, welfare and recreational needs of residents and visitors,

(i) to ensure that development does not conflict with the hierarchy of business and retail centres in the Port Macquarie-Hastings area and the role of the Greater Port Macquarie Central Business District as the focal point for subregional functions and service delivery,

(j) to identify and protect features of environmental, cultural or visual importance within the Port Macquarie-Hastings area,

(k) to ensure that new urban development makes a positive contribution to the public domain and streetscape,

(l) to facilitate efficient use of urban land and infrastructure by appropriate staging of development and ensuring appropriate density of development,

(m) to provide effective and efficient connectivity and movement corridors within and between subdivisions.

This EIS discusses the potential impacts of the Proposal on the environment, including on biodiversity, waterways and water resources, community amenity and socio-economic factors. Through the implementation of the mitigation measures identified throughout the EIS and compiled in Section 10, the Proposal will support the aims of the PMHC LEP.

The Proposal Site is zoned SP2 – Waste or Resource Management Facility. The objects of the zoning are to provide for infrastructure and related uses, and to prevent development that is not compatible or may detract from the provision of infrastructure. Development for the purpose of a waste or resource management facility is permitted on the site with consent. The Proposal is therefore considered permissible, subject to development consent.

PMHC Development Control Plan 2013

As noted in Section 6.3.12, Clause 11 of SEPP S&RD deems that DCPs established under the PMHC LEP, are not applicable to the Proposal. However, the SEARs request that an assessment of compliance against the DCP is undertaken. As such, consideration has been given to the objectives of the PMHC DCP 2013 in order to demonstrate consistency of the Proposal with the overarching aims of the PMHC DCP 2013 for the Proposal Site and surrounds. The PMHC DCP 2013 was prepared to support provisions of the PMHC LEP 2011 by providing guidance to persons carrying out development and to Council and landowners in preparation and assessment of development applications. General provisions of the PMHC DCP 2013 and how they would be/have been addressed in the Proposal are included in Table 6-3 include:

Table 6-3 Proposal consideration of the general provisions of PMHC DCP 2013

PMHC DCP 2013 general provisions	Consideration for the Proposal	Section addressed in EIS
Chapter 2.2 Advertising and signage		
Advertising and signage	Some minor additional signage may be required as part of the Proposal for the three stages and will be located within the property boundaries and mounted appropriately.	Section □
Chapter 2.3 Environmental management		
Minimising environmental impacts	The impacts of the Proposal on the environment, landscape, visual character and amenity, natural watercourses, riparian vegetation, topographical features of the environment and public infrastructure have been identified and assessed in this EIS.	Section 8
	This EIS also assesses the impacts and benefits of the Proposal to all impacted persons and the general public, and provide measures to compensate for and minimise any net adverse impacts.	Section 9.1
	Preliminary plans indicating the final landform have been included in the Concept Design Report.	Appendix B
Appropriate protection and management of environmental areas	The Cairncross WMF has an existing Compensatory Habitat Management Plan that would apply to the Proposal. The plan assigns responsibilities and timing for prescribed management actions necessary to maintain the compensatory habitat area. The Proposal includes clearing of 3.4 ha of existing vegetation Blackbutt Plantation which is permitted to be progressively cleared for the purposes of expansion of the landfill under approval GR0412P (26 October 2004).	Section 8.2
Chapter 2.4 Hazards management		
Bushfire, airspace, and stormwater hazard management	Bushfire management measures including Asset Protection Zones are located outside of environmental protection zones and wholly within the Proposal Site, where necessary. All risks of other hazards have been identified in the environmental risk assessment with associated mitigation measures proposed. The mitigation measures will be incorporated into the OEMP.	Chapter 7 and Section 8.13

PMHC DCP 2013 general provisions	Consideration for the Proposal	Section addressed in EIS
Chapter 2.5 Transport, traffic management, access and car parking		
Road hierarchy, car parking, industrial development, and traffic generating development	Onsite parking will remain unchanged from the existing situation. Additional parking as a result of the Proposal is not required as the Proposal only includes the expansion of the landfill. Site access and egress is via Forest Hut Road with direct connectivity to the Pacific Highway. The intersection of Pacific Highway/Forest Hut Road/Bill Road satisfies the minimum sight distance requirement (ASD) and the desirable sight distance requirement (SISD) measured in accordance with the Austroads requirements.	Section 8.8
Chapter 2.6 Tree management		
Tree management – private land	The Proposal includes clearing of 3.4 ha of existing vegetation Blackbutt Plantation which is permitted to be progressively cleared for the purposes of expansion of the landfill under approval GR0412P (26 October 2004).	Section 8.2
Chapter 2.7 Social impact assessment and crime prevention		
Social impact assessment and crime prevention	A social impact assessment has been conducted for the Proposal. Overall, the Proposal will have a positive socio-economic impact. The Proposal Site will be secure and unauthorised entry prevented.	Section 9.1

PMHC Development Control Plan 2011

Parts 1-4 of the PMHC DCP 2011 are superseded by DCP 2013. The enduring Part of DCP 2011 are area-based provisions. The area-based provisions of DCP 2011 provide specific guidance for development outcomes in the different areas of PMHC LGA. The Proposal Site is, however, not located on land subject to area-based provisions and therefore not bound by any development guidelines of the PMHC DCP 2011.

7 ENVIRONMENTAL RISK ASSESSMENT

The SEARs identified the key environmental issues, or risks, which have been discussed in this EIS (see Section 1.5). These key issues were reviewed as part of an Environmental Risk Assessment (ERA). The purpose of the ERA was to identify the level of risk associated with the Proposal before and after the application of the mitigation measures outlined in Section 10, and to determine whether the residual risks are considered acceptable. Risks were therefore provided an 'initial' risk ranking and a 'residual' risk ranking, assuming effective implementation of the proposed mitigation measures.

The methodology used for the ERA, and the outcomes of this process, are outlined below.

7.1 ERA methodology

The ERA assigned a qualitative environmental risk category to each key issue. Table 7-1 provides a matrix of the risk likelihood and consequence which is used to guide the identification of an appropriate risk rating (low, moderate, high, very high).

Table 7-1 Risk analysis criteria and categories

Likelihood	Consequence				
	1 – Not significant	2 – Minor	3 – Moderate	4 – Major	5 – Severe
A – Almost certain	Moderate	Moderate	High	Very High	Very High
B – Likely	Low	Moderate	High	Very High	Very High
C – Possible	Low	Low	Moderate	High	High
D – Unlikely	Low	Low	Low	Moderate	Moderate
E – Rare	Low	Low	Low	Low	Moderate

The risk category is determined on the basis of the likelihood of an impact occurring and the consequences of the impact occurring. The criteria for evaluating likelihood and consequence are identified in Table 7-2 and Table 7-3 respectively.

Table 7-2 Criteria for evaluating likelihood

Level	Descriptor	Description	Frequency of occurrence
A	Almost Certain	Is expected to occur in most circumstances	Once per month
B	Likely	Will probably occur in most circumstances	Between once a month and once a year
C	Possible	Might occur at some time	Between once a year and once in five years
D	Unlikely	Could occur at some time	Between once in five years and once in 20 years
E	Rare	May occur in exceptional circumstances	Once in more than 20 years

Table 7-3 Criteria for evaluating consequence[14]

Level	Category	Safety	Financial	Operational	Environmental	Community
1	Not Significant	No medical control required	<$100,000	< 6 hours disruption to operations	Pollution release immediately contained on-site, no need for external assistance. No impact on native vegetation / fauna / fauna habitat.	No community or stakeholder complaints.
2	Minor	Lost time injury occurs or medical control required	≥ $100,000 but less than $1M	≥ 6 hours but < 24 hours disruption to operations	Pollution release to environment contained on-site in < 24 hours, no need for external assistance. Minor impacts to native vegetation / fauna / fauna habitat on-site.	Several community or stakeholder complaints. Complaints rectified within adequate timeframes.
3	Moderate	Serious injury occurs	≥ $1M but less than $2M	≥ 24 hours but < 48 hours disruption to operations	Pollution release to off-site environment with short-term, localised, detrimental effect. Moderate, short-term impact to vegetation / fauna habitat requiring action to correct or minor impact on threatened species or communities.	Multiple and sustained community or stakeholder complaints. Complaints addressed after an interval. Limited media coverage of issues raised.
4	Major	Single fatality occurs	≥ $2M but less than $10M	≥ 2 days but < 5 days disruption to operations	Pollution release to off-site environment with medium-term, regional detrimental effect. Major, medium-term impact to vegetation / fauna habitat requiring action to correct or moderate impact on threatened species or communities.	Widespread community and stakeholder concern. Sustained failure to address complaints. Extensive media coverage.

[14] Criteria modified from Arcadis template for project specific risk assessment

Level	Category	Safety	Financial	Operational	Environmental	Community
5	Severe	Multiple but localised fatalities occur	≥ $10M	≥ 5 days disruption to operations	Pollution release to off-site environment with long-term, wide-spread detrimental effect. Severe, long-term impact to vegetation / fauna habitat or major impact on threatened species or communities.	Ongoing and widespread community and stakeholder concern, culminating in litigation. Inability to address complaints. Extensive and sustained negative media coverage.

7.2 ERA outcomes

A summary of the preliminary environmental risk assessment is provided in Table 7-4.

Table 7-4 Summary of environmental risk assessment for the Proposal

Environmental aspect	Initial risk identified	Initial risk rating (pre-mitigation)	Mitigation	Residual risk (post-mitigation)	EIS reference
Waste management	Poor waste management during operation resulting in impacts on the surrounding environment (e.g. escape of leachate, litter).	Moderate	Management of waste during construction and operation will be covered by an Operational Environmental Management Plan (OEMP). The OEMP will incorporate mitigation measures outlined throughout this EIS which aim to ensure effective on-site waste management and minimise the potential for waste to leave the Proposal Site.	Low	Addressed throughout this EIS, including specifically Section 5.6 and 5.9.11
Flora and fauna	Impacts on biodiversity during construction and operation of the Proposal.	High	Site investigation has confirmed that the Proposal will have impacts on native vegetation, including habitat for threatened and migratory fauna species. Measures to mitigate impacts on biodiversity, including the establishment of an offset site(s), have been identified in Section 8.2 and will be incorporated into the OEMP.	Low	Section 8.2
Soil, water and leachate	Potential to interact with contaminated soil and/or cause soil contamination during construction or operation, therefore causing environmental and/or community impacts.	Low	Investigations have confirmed that the potential for contamination during construction and operation is low. Measures to mitigate potential contamination impacts are outlined in Section 8.3, 8.4 and 8.5 and will be incorporated into the OEMP.	Low	Section 8.3, 8.4 and 8.5

Environmental aspect	Initial risk identified	Initial risk rating (pre-mitigation)	Mitigation	Residual risk (post-mitigation)	EIS reference
Soil, water and leachate	Discharge of surface water pollution caused during construction or operation of the Proposal.	Moderate	The concept design for the Proposal incorporates a range of measures to ensure the separation of clean and dirty water and appropriately manage dirty water during both construction and operation of the Proposal. Measures to mitigate potential surface water impacts are outlined in Section 8.3, 8.4 and 8.5 and will be incorporated into the OEMP.	Low	Section 8.3, 8.4 and 8.5
Soil, water and leachate	Discharge of contaminated groundwater from site.	High	A range of measures have been incorporated into the design of the Proposal to prevent contamination of groundwater. Measures to mitigate potential contamination impacts are outlined in Section 8.3, 8.4 and 8.5 and will be incorporated into the OEMP.	Low	Section 8.3, 8.4 and 8.5
Soil, water and leachate	Contact with contaminated groundwater and/or pollution of groundwater from chemicals/leachate entering groundwater system during construction or operation of the Proposal.	High	Management of leachate has been considered as part of the design of the Proposal, which complies with the requirements of the Guidelines. The proposed leachate barrier, collection, storage and treatment system is described in Section 8.5.	Low	Section 8.3, 8.4 and 8.5
Hazards and risk	Impacts from the release of hazardous materials and dangerous goods.	Moderate	Measures to ensure the safe handling and management of dangerous goods are outlined in	Low	Section 8.13

Environmental aspect	Initial risk identified	Initial risk rating (pre-mitigation)	Mitigation	Residual risk (post-mitigation)	EIS reference
			Section 8.13 and will be incorporated into the OEMP.		
Hazards and risk	Potential bushfire impacts (the site and surrounding land is considered high risk for bushfire).	Moderate	The Proposal will include a number of mitigation measures, including defendable space setbacks, on-site firefighting equipment and procedures, to ensure that there is limited potential for increased occurrence or severity of bushfire on the Proposal site or surrounds. The mitigation measures outlined in Section 8.13 and will be incorporated into the OEMP.	Low	Section 8.13
Air quality and odour	Dust generated during construction and operation of the Proposal.	Moderate	Implementation of measures such as minimising areas of stockpiled materials/surfaces, covering loads, and use of water carts to suppress visible dust. The mitigation measures outlined in Section 8.6 will be incorporated into the OEMP.	Low	Section 8.6
Air quality and odour	Odour generation during construction and operation of the Proposal.	High	Implementation of measures such as covering/capping of waste, informal odour assessment by facility personnel, and continuation of the existing complaints register will help mitigate odour impacts. The mitigation measures outlined in Section 8.6 will be incorporated into the OEMP.	Low	Section 8.6

Environmental aspect	Initial risk identified	Initial risk rating (pre-mitigation)	Mitigation	Residual risk (post-mitigation)	EIS reference
Noise and vibration	Noise and vibration generated during construction and operation of the Proposal.	Moderate	Implementation of measures relating to vehicles and plant, and continuation of the existing complaints register will help mitigate noise impacts. A framework for mitigating and managing noise levels at sensitive receivers is described in Section 8.7. The mitigation measures will be incorporated into the OEMP.	Low	Section 8.7
Traffic and transport	Impacts associated with traffic generated during construction and operation of the Proposal (e.g. traffic delays, reduced level of service (LoS), safety impacts.	Low	Implementation of measures such as Standard Operating Procedures will help mitigate traffic and transport impacts. Traffic and transport mitigation measures are outlined in Section 8.8 and will be incorporated into the OEMP.	Low	Section 8.8
Greenhouse gas	Release of greenhouse gas emissions	High	The development of a landfill gas management plan based on the findings of a landfill gas monitoring program for Stages 1 to 3 would substantially reduce the emissions profile of the Proposal over its lifetime. Mitigation measures are outlined in Section 8.9 and will be incorporated into the OEMP.	Moderate	Section 8.9
Aboriginal heritage	Impacts to Aboriginal heritage during construction and operation of the Proposal	Moderate	The Aboriginal heritage assessment (Adise 2016) found there is no potential for the survival of in-situ Aboriginal artefacts or sub-surface archaeological deposits at the Proposal Site but that some undetected small	Low	Section 8.10

Environmental aspect	Initial risk identified	Initial risk rating (pre-mitigation)	Mitigation	Residual risk (post-mitigation)	EIS reference
			displaced artefact scatters and isolated/dispersed Aboriginal artefacts may well occur. As there is potential for unexpected Aboriginal objects to be encountered during construction, measures to mitigate impacts on potential unexpected finds have been included in Section 8.10 and will be incorporated into the OEMP.		
Non-Aboriginal heritage	Impacts to Non-Aboriginal heritage during construction and operation of the Proposal	Low	The non-Aboriginal heritage assessment (Adise 2016) found that the Proposal Site does not contain or encroach upon any non-Aboriginal heritage registered/listed sites, places or relics. Mitigation measures related to potential unexpected finds of non-Aboriginal heritage items are included in Section 8.11 and will be incorporated into the OEMP.	Low	Section 8.11
Visual impacts	Visual impacts of the Proposal during construction and operation	Low	As the Proposal Site is located within the Cairncross WMF, which has natural screening, there is not expected to be any visual impacts to sensitive receivers. Nevertheless, mitigation measures to address potential impacts are outlined in Section 8.12 and will be incorporated into the OEMP.	Low	Section 8.12

8 KEY ENVIRONMENTAL ISSUES

This section outlines the potential environmental impacts of the Proposal. When assessing the potential impacts, it has been assumed that the Proposal will be constructed and operated as per the design outlined in the Proposal Description (Section 5). Key design elements (e.g. floor levels, cover/capping processes/design, leachate management strategy, stormwater management strategy, landfill gas management strategy etc.) are not considered to be mitigation measures given these have been incorporated into the design of the Proposal and as such, are not repeated in this Chapter of the EIS.

In addition, PMHC currently operates the Stage E landfill under a comprehensive OEMP (Appendix T). The OEMP includes a broad range of environmental management and mitigation measures which are being effectively implemented on the Stage E landfill, and which would be expanded to cover the Proposal Site. The OEMP would be updated to include additional and tailored mitigation measures relevant to the Proposal as described below in Sections 8.1 to 9.3.

8.1 Strategic land use planning

The SEARs require that the EIS for the Proposal address strategic land use planning, including consistency with NSW and Federal government strategies and strategic land use policies. The key policies include; the WARR Strategy, NSW 2021, the Waste Strategy and the National Waste Policy. The Proposal's consistency with these policies is outlined in Section 3.3.

The SEARs also require that the EIS address the suitability of the site for the proposed development. This section addresses the designated land use zone, the existing land use at and surrounding the Proposal Site, and the appropriateness of the proposed land use to accommodate the Proposal.

Table 8-1 provides a summary of the relevant SEARs, which relate to strategic land use planning and where these have been addressed in this EIS.

Table 8-1 SEARs relevant to strategic land use planning

SEAR	Where addressed in EIS?
Strategic land use planning	Section 8.1

8.1.1 Existing environment

As identified in Section 2 and Section 3.4.2, an intensive site selection process was undertaken to consider strategic land use planning aspects and identify an appropriate landfill site prior to development of the Cairncross WMF (including the existing landfill in 2001). The area for the landfill was identified in the *Hastings Regional Waste Disposal Facility Site Selection Study* (Patterson Britton and Partners, 1994) and considered the following criteria:

- The site is located at the head of a shallow valley feature extending south from a low east-west ridge passing along the northern part of the site. Therefore, there is minimal surface water draining onto the site from areas above the landfill, a key benefit in minimising leachate generation levels and stormwater management issues
- The landfill area is contained within a low ridge feature which provides natural boundaries for the landfill

- The Proposal Site is well buffered from sensitive receivers. The nearest sensitive receivers (shown in Figure 8-1) are residential properties located approximately 1.3 kilometres to the north-east and more than 0.8 kilometres to the south-west of the Proposal Site
- The landfill is contained within a single valley feature and therefore does not impact on other drainage catchments
- The contours of the site and the extent of the area available to be retained as natural buffers ensure that the site will not be visible from any area outside the site
- The site includes natural clay and shale which is suitable for use on the Proposal
- The site is well serviced by arterial road networks
- The site is located above flood liable land.

Having established the suitability of the Cairncross WMF at the time of the 1999 EIS, which included the concept plan for the extension area which is the subject of this EIS, the remainder of this section focuses on the land use zoning at the site, existing land use, and surrounding land uses.

Land use zone

The Proposal Site lies within the Cairncross WMF which was re-zoned from 'R1 Rural' to SP2 Infrastructure (Waste or Resource Management Facility) under the Hastings Local Environmental Plan 1987 as part of the approval granted for that facility in 1999. The approval covered the Stage E landfill and the EIS which supported the approval identified the likely future expansion of the landfill in the areas now being proposed for the Stage 1, 2 and 3 landfill areas.

Under the PMHC LEP, the Proposal Site is zoned SP2 Infrastructure (Waste or Resource Management Facility). The objectives for this land use zone include:

- To provide for infrastructure and related uses
- To prevent development that is not compatible with or that may detract from the provision of infrastructure.

Development that is permitted with consent for areas zoned SP2 include:

- any development that is ordinarily incidental or ancillary to development for that purpose; Roads.

All development that is not "permitted with consent" or is inconsistent with the objectives for the zone are prohibited.

Existing land use

The majority of the Proposal Site, with the exception of the Stage E landfill, is currently occupied by *Eucalyptus pilularis* (Blackbutt) timber plantations. A further 3.4 hectares of native vegetation occupies the south-eastern corner of the Proposal Site, within the proposed Stage 3 landfill area.

Surrounding land use

The surrounding land is zoned RU3 (Forestry) and E1 (National Parks and Nature Reserves). The Cairncross State Forest (RU3) is located to the north and south of the Proposal Site with the Rawdon Creek Nature Reserve (E1) located to the south-east. The western edge of the Proposal Site is bordered by land zoned SP2 Infrastructure (Waste and Resource Management Facility) which contains a compensatory habitat area that was established as part of the Cairncross WMF. To the west of the

compensatory habitat area is Pembrooke Road, beyond which is agricultural land zoned for Primary Production (RU1).

The nearest sensitive receivers (shown in Figure 8-1 are residential properties located approximately 1.3 kilometres to the north-east and more than 0.8 kilometres to the south-west of the Proposal Site.

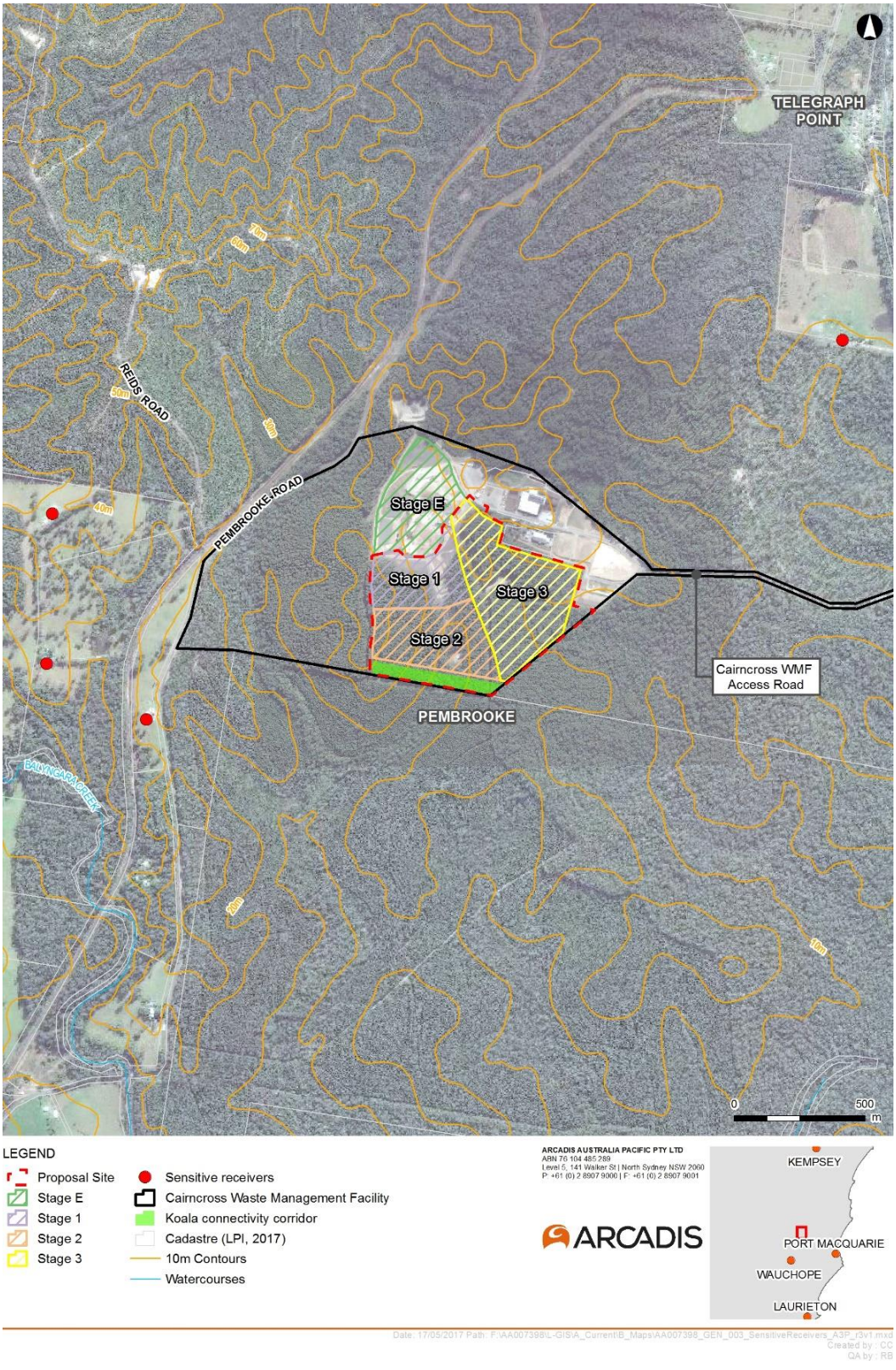


Figure 8-1 Nearest sensitive receivers

8.1.2 Assessment of impacts

Land use zone

As identified above, the Proposal Site is zoned SP2 Infrastructure (Waste and Resource Management Facility) and the proposed landfill extension is permissible with consent under the PMHC LEP. No alterations to the current land zoning are proposed as part of the Proposal.

Existing land use

Clearing of Blackbutt timber plantations on the Proposal Site would take place under an authorisation for timber plantation granted under the *NSW Plantations and Reafforestation Act 1999* (see Appendix P). The authorisation, dated 26 October 2004, grants approval to manage the area as a plantation in accordance with the Plantations and Reafforestation Code and for the timber to be cleared and withdrawn from plantation activities to facilitate expansion of the waste management facility. The clearing would take place progressively during the construction and operation of the Proposal under the aforementioned authorisation. Clearing of an additional 3.4 hectares of native vegetation would take place under the approval being sought through this EIS. Impacts from clearing on the Proposal Site are discussed in Section 8.2.

Surrounding land use

The Proposal is unlikely to *directly* impact on the land use in the adjacent State Forest, Nature Reserve, compensatory habitat area or residential receiver locations. Potential *indirect* impacts to users of the adjacent land include visual, noise, air quality, off-site migration of litter, waste dumping, and soil and water quality impacts. These impacts are discussed in the relevant sections of this EIS.

8.1.3 Mitigation measures

As identified above, the Proposal is not expected to have any land use impacts (with the exception of clearing, as addressed in Section 8.2) and therefore no mitigation measures are required.

8.2 Flora and Fauna

Arcadis has prepared a *Biodiversity Assessment Report* (BAR) for the Proposal in accordance with OEH's *Framework for Biodiversity Assessment* (FBA) under the NSW Biodiversity Offsets Policy for Major Projects. The BAR (Arcadis, 2017) is included in Appendix P to this EIS.

This Section provides a summary of potential impacts to biodiversity as a result of the Proposal as assessed in the BAR. Measures to mitigate impacts have also been identified where they are required.

Table 8-2 provides a summary of the relevant SEARs, which relate to Biodiversity and where these have been addressed in this EIS.

Table 8-2 SEARs relevant to biodiversity

SEAR	Where addressed in EIS?
• An assessment of the proposal under the Framework for Biodiversity Assessment (Oct 2014) including an assessment of any potential impacts on riparian vegetation and groundwater dependent ecosystems.	Appendix P, Sections 8.2 and 8.4.
• Biosecurity, pests and vermin	Section 8.2

8.2.1 Methodology

Under the FBA, the area subject to impact assessment is referred to as the 'Development Site'. In this assessment, the Development Site is considered to comprise of the 3.4 hectares' area of native vegetation within the Proposal Site that is not already subject to approval for clearing and is shown in Figure 8-2.

The majority of the Proposal Site is subject to an authorisation for timber plantation under the NSW *Plantations and Reafforestation Act 1999* (Appendix O). The authorisation, dated 26 October 2004, grants approval to manage the area as a plantation in accordance with the Plantations and Reafforestation Code and for the areas of the authorised plantation that are cleared to be withdrawn from plantation activities to facilitate expansion of the waste management facility. As the clearing of vegetation within the authorised plantation area has been approved, the impacts of clearing this vegetation are not part of this assessment.

The current assessment was based on the following information:

- Database interrogation including: the NSW Threatened Species Profile Database (TSPD), the Vegetation Information System (VIS) classification database, the overcleared landscapes database (Mitchell landscapes), the Directory of Important Wetlands in Australia (DIWA) and the Protected Matters Search Tool.
- Literature review of reports, vegetation maps, topographic maps, aerial photography and literature including, but not limited to, the following:
  - *Cairncross Waste Depot Species Impact Statement* (Milledge, 1998).
  - *Statutory Ecological Impact Assessment: Proposed Industrial Waste Precinct, Cairncross Waste Management Facility, Cairncross State Forest* (Darkheart Eco-Consultancy, 2013).
- Review of vegetation mapping, including:

  - *A Vegetation Map for the Northern Rivers Catchment Management Authority to support application of the Biodiversity Forecasting Toolkit* (Eco Logical Australia, 2005).
  - *Vegetation of the Port Macquarie-Hastings Local Government Area* (Biolink, 2013).
- Field assessments undertaken in April and May 2015 by Arcadis Ecologists. Field assessments comprised: vegetation plots sampled in accordance with the Biobanking Assessment methodology (BBAM) (Figure 8-3); targeted searches for threatened flora species; and targeted threatened fauna species using a range of survey techniques, including habitat assessment, diurnal bird surveys, arboreal and ground hair tubes, remote camera sampling, Koala Spot Assessment Technique (SAT) (Phillips and Callaghan, 2011) and call playback surveys, Anabat surveys, spotlight surveys, fog call playback, nocturnal searches and tadpole surveys, owl call playback, reptile hand searches (Figure 8-4).

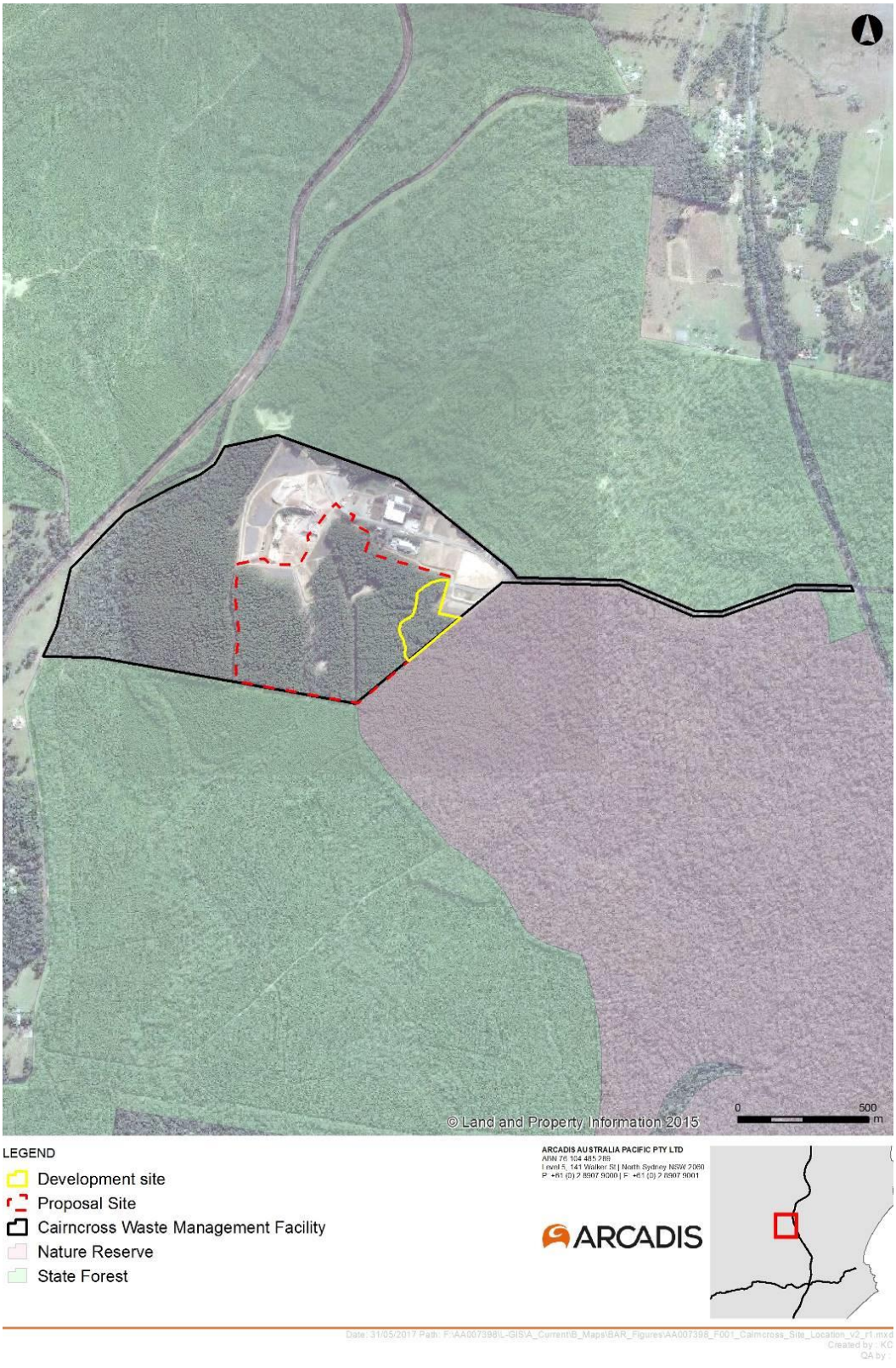


Figure 8-2 Development site location (i.e. native vegetation not subject to clearing permit)

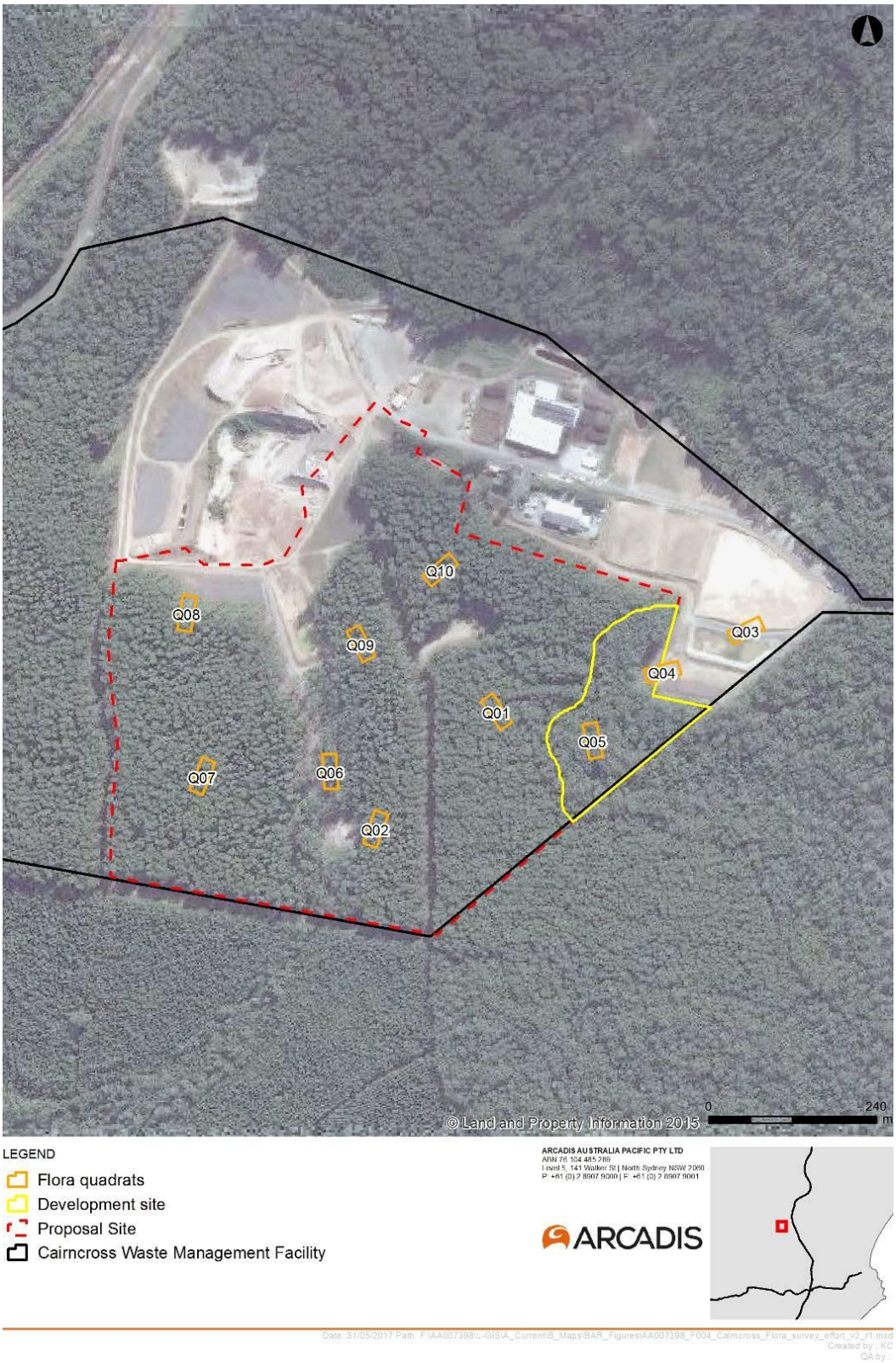


Figure 8-3 Location of flora survey quadrats

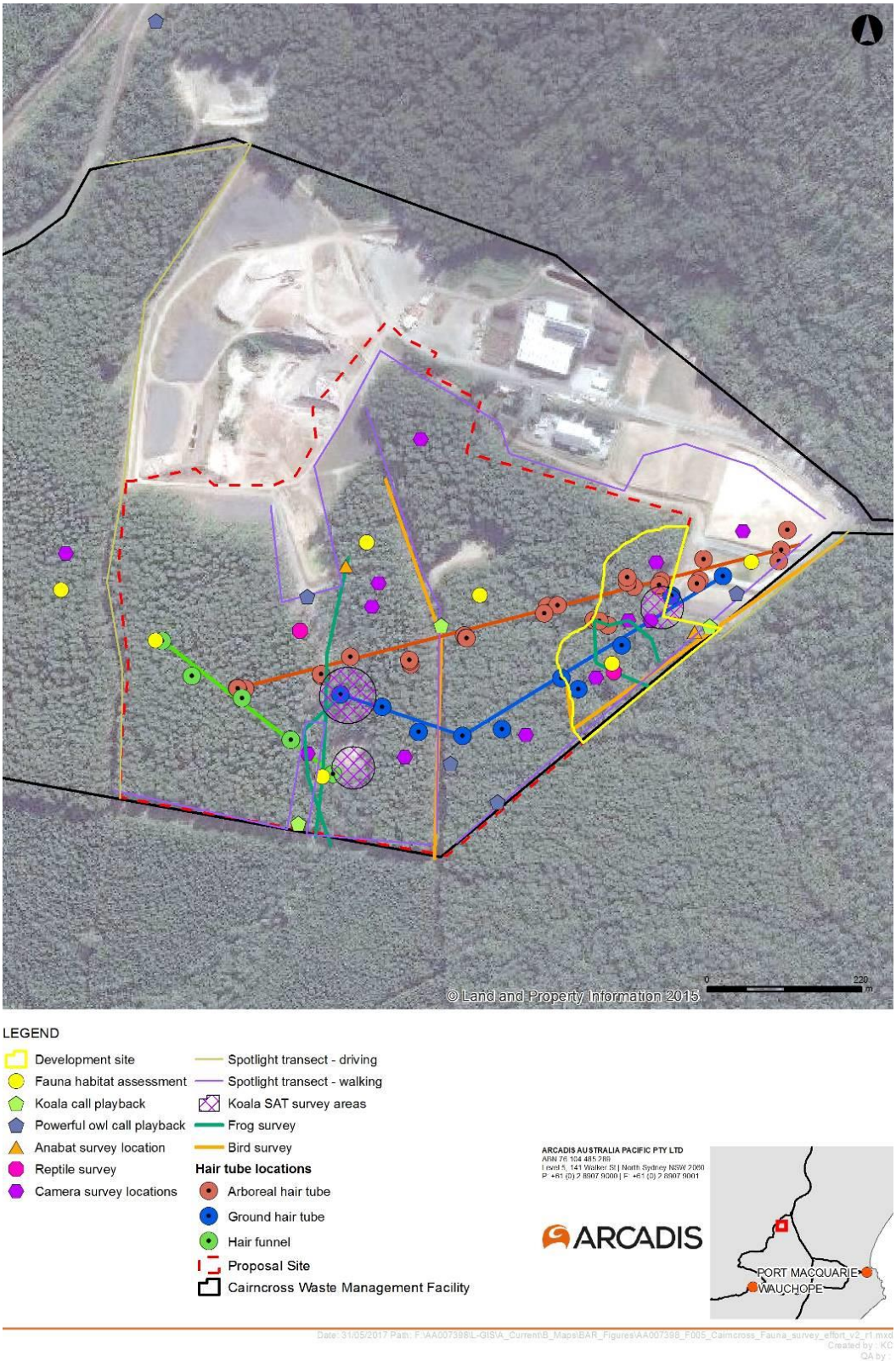


Figure 8-4 Fauna survey locations

8.2.2 Existing environment

Landscape value

The FBA requires the assessment of landscape features to describe the biodiversity values of the study area and assess the impacts of the Proposal. Landscape features relevant to the FBA calculations are shown on Figure 8-5 and summarised in Table 8-3.

The Proposal is a site-based development; as such, the landscape value has been assessed in accordance with the methodology in Appendix 4 of the FBA (OEH 2014). Two assessment circles were mapped to enable assessment of landscape values, including the percent current extent of native vegetation cover within and adjacent to the development site. In accordance with the allowable combinations of inner and outer assessment circles in Table 8 of the FBA, an inner circle of 100 hectares and an outer circle of 1000 hectares were used. Both circles were centred on the development site and are shown on Figure 8-5.

Table 8-3 Landscape features

Landscape feature	Development site
IBRA (Interim Biogeographic Regionalisation for Australia) bioregions and subregions	The development site is located within the Northern Rivers Bioregion and the Macleay – Hastings Subregion classified under IBRA.
Major Catchment Area	The development site is located within the Northern Rivers Major Catchment Area (MCA).
Mitchell landscapes	The development site is located within Wauchope Coastal Foothills Mitchell landscape.
Rivers, streams and wetlands	An unnamed ephemeral watercourse intersects the Development Site, flowing in a south-easterly direction. The watercourse flows into a tributary of Tommy Owens Creek, which it joins approximately 2 km south-east of the Development Site. The watercourse on the Development Site is a first order stream under the Strahler stream ordering system.
Native vegetation cover in landscape	The native vegetation cover in the landscape was determined with reference to the regional vegetation mapping by Eco Logical Australia (2005) (Figure 8-5). All native vegetation types mapped by Eco Logical Australia (2005) within the inner and outer assessment circles were considered to represent the current native vegetation cover. The future native vegetation cover was determined by subtracting the area of native vegetation to be cleared for the Proposal from the current summed native vegetation cover in each circle. Native vegetation cover percentages were calculated as a proportion of all land within each assessment circle that contains native vegetation. The current percent native vegetation cover in the inner assessment circle is 36-40%, and in the outer assessment circle is also 51-55%.

Landscape feature	Development site
	The future percent native vegetation cover in the inner assessment circle is 36-40%, and in the outer assessment circle is 51-55%. Scores for each percent cover were then determined using the score criteria in Table 9, Appendix 4 of the FBA.
Connectivity value	The connectivity assessment involved an estimate of the linkage width between habitat on the Development Site and adjoining areas of habitat, both before and after development. A site is linked to adjoining vegetation where the adjoining vegetation is in moderate to good condition, has a patch size greater than 1 ha, is separated by a distance of less than 100 m (for woody vegetation) and is not separated by a hostile gap such as a dual carriageway or wider highway, railway line or large water body. The linkage width was determined by identifying the area of most limiting width between vegetation on site and connected vegetation. The current linkage width was measured using aerial photograph interpretation. The condition of the connecting link was assessed based on site inspections and aerial photograph interpretation. There is currently full connectivity between the vegetation on the Development Site and adjoining areas. The linkage width before and after development was determined to be in the >100 m – 500 m class; clearing of all vegetation on the Development Site will not reduce the linkage width to less than 100 m. The condition of the vegetation link was determined to be at benchmark for overstorey condition and at greater than 25% of lower benchmark for midstorey/ground cover condition before development, and with no native over-storey, mid-storey or ground cover after development.
Patch size	The Development Site forms part of a larger patch of native vegetation extending into Rawdon Creek Nature Reserve to the south-east and areas of State Forest to the south and north. The continuous patch of native vegetation is bounded by the North Coast Rail Line to the west, the Pacific Highway to the east, and the Hastings River to the south and is approximately 1,800 ha in area. The vegetation in the Development Site has been assigned the maximum patch size of 1,001 ha. In accordance with the criteria in Table 15 of Appendix 4 of the FBA, the patch size class is considered to be *extra large* with a corresponding patch size score of 12.

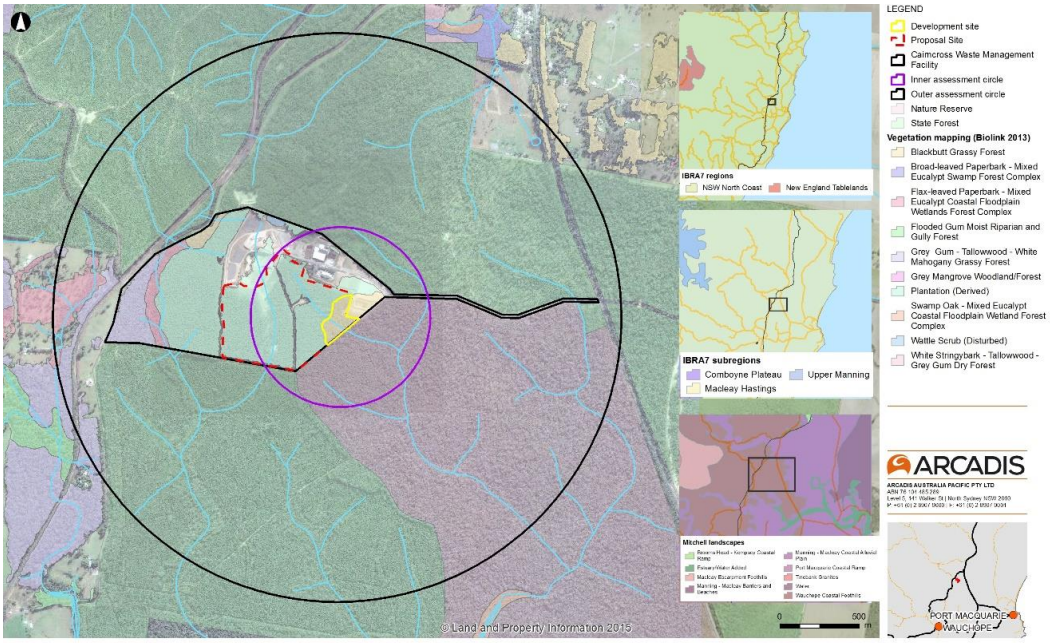


Figure 8-5 Landscape features

Native vegetation

The vegetation on the site consisted of a tall open forest with a mature canopy of *Eucalyptus microcorys* (Tallowwood), *Eucalyptus pilularis* (Blackbutt), *Corymbia intermedia* (Pink Bloodwood), *Eucalyptus resinifera* (Red Mahogany) and *Eucalyptus globoidea* (White Stringybark). The midlayer included small trees and tall shrubs such as *Alphitonia excelsa* (Red Ash), *Allocasuarina littoralis* (Black She-Oak), *Acacia floribunda* (White Sally) and *Callistemon salignus* (White Bottlebrush). The ground layer was generally grassy and herbaceous, with *Gahnia sieberiana* (Red-fruit Saw-sedge), *Entolasia marginata* (Bordered Panic), *Imperata cylindrica* (Blady Grass), *Entolasia stricta* (Wiry Panic) and *Oplismenus imbecillis* (Narrow-leaved Basket-grass) being dominant.

In the eastern parts of the development area, the ground was slightly boggy and swamp forest elements of the community were dominant, with *Callistemon salignus* forming a dense midstorey and *Gahnia sieberiana* prevalent in the ground layer.

The vegetation appeared to have been recently burnt, but was regenerating. Occurrence of exotic species in the Development Site was low, limited to some small patches of *Lantana camara* (Lantana).

Plant Community Types

One Plant Community Type (PCT) was identified on the Development Site: Blackbutt - Pink Bloodwood shrubby open forest of the coastal lowlands of the NSW North Coast Bioregion (NR117). This PCT is in the North Coast Wet Sclerophyll Forests Vegetation Class and its percent cleared estimate in the Northern Rivers Major Catchment Area is 50 percent.

Blackbutt - Pink Bloodwood shrubby open forest of the coastal lowlands of the NSW North Coast Bioregion is not associated with any threatened ecological communities listed under the TSC Act or EPBC Act.

This PCT formed a single vegetation zone, as it was found to be in Moderate to Good condition.

Vegetation condition

This PCT formed a single vegetation zone, as it was found to be in Moderate to Good condition.

The site value score for the vegetation zone identified on the Development Site was determined through assessment of site attribute data collected in two vegetation plots. The site attribute data was entered into the Biobanking credit calculator to generate site value scores.

Fauna habitat

Open forest

The Development Site comprised tall open forest. The canopy was up to 30 metres in height and dominated by eucalypts such as Blackbutt and Tallowwood. The canopy would provide shelter and foraging habitat for arboreal fauna, including Koalas. Koala feed trees comprised about 45 percent of the canopy species in this habitat. Hollow-bearing trees were present in low densities; four were recorded on the Development Site. Trees with large basal cavities were present. The midstorey was dominated by paperbarks approximately 5 metres in height with a dense cover of approximately 70 percent.

The understorey comprised dense grassy groundcover interspersed with soaks and scattered patches of dense sedges. Hollow logs and fallen timber were present in high densities. Grasses and timber would provide shelter for ground-dwelling fauna. Cavernous areas in the grass and runs/tracks and diggings were common in the ground-layer indicating high activity of ground-dwelling fauna in this habitat type. Camera traps identified a diversity of fauna in this habitat including Swamp Wallaby, Eastern Grey Kangaroo, Northern Brown Bandicoot and Bush Rat.

Habitat connectivity

Rawdon Creek Nature Reserve lies east and south of the Development Site, separated by a vehicle access track, approximately 5 metres wide. The canopy is well connected over the access track and woodland birds were frequently observed moving between the site and nature reserve.

West of the Development Site lies tall open forest that is connected to Cairncross State Forest. It is regularly burnt and harvested under a forestry agreement. The understorey was recently burnt at the time of the field survey which resulted in minimal groundcover and midstorey vegetation. Connectivity for species that require adequate vegetation cover would therefore be limited after burns or timber harvesting.

Groundwater dependent ecosystems

Mapping in the Australian Government's Atlas of Groundwater Dependent Ecosystems (GDE) (Bureau of Meteorology, 2016) shows that the area within approximately three kilometres of the Proposal Site has been classified as having moderate to high potential for groundwater interaction with the presence of surface GDEs that rely on the subsurface expression of groundwater.

Noxious weeds and pests

Two of the exotic species recorded on the Development Site are listed as noxious weeds in the Local Control Authority area of PMHC (Table 8-4).

Table 8-4 Noxious weeds recorded on the Development Site

Scientific name	Common name	Control class
Lantana camara	Lantana	4
Senecio madagascariensis	Fireweed	4

The current extent of vermin and pest infestations on the Development Site is not known. The current land uses on the Development Site are not likely to attract large numbers of vermin and pests; however, there is habitat on site for vermin and pests in native vegetation. The Pest Management Plan prepared for the Cairncross Waste Management Facility (PMHC, 2013) identifies three pest species that currently pose problems on the site: Feral Cats, Indian Mynas (also known as Common Mynas) and Foxes. A control action plan is described in the Pest Management Plan.

Threatened species

Ecosystem credit species

The PCT identified on the Development Site is predicted to contain the following ecosystem credit species, as determined by the credit calculator:

- Barred Cuckoo-shrike (*Coracina lineata*)
- Bush Stone-curlew (*Burhinus grallarius*)
- Eastern Freetail-bat (*Mormopterus norfolkensis*)
- Glossy Black-Cockatoo (*Calyptorhynchus lathami*)
- Golden-tipped Bat (*Kerivoula papuensis*)
- Greater Broad-nosed Bat (*Scoteanax rueppellii*)
- Hoary Wattled Bat (*Chalinolobus nigrogriseus*)
- Little Eagle (*Hieraaetus morphnoides*)
- Little Lorikeet (*Glossopsitta pusilla*)
- Long-nosed Potoroo (*Potorous tridactylus*)
- Masked Owl (*Tyto novaehollandiae*)
- Powerful Owl (*Ninox strenua*)
- Red-legged Pademelon (*Thylogale stigmatica*)
- Sooty Owl (*Tyto tenebricosa*)
- Spotted-tailed Quoll (*Dasyurus maculatus*)
- Square-tailed Kite (*Lophoictinia isura*)
- Varied Sittella (*Daphoenositta chrysoptera*)
- Wompoo Fruit-dove (*Ptilinopus magnificus*)
- Yellow-bellied Glider (*Petaurus australis*)
- Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*).

Each species has been assessed for potential presence in each of the vegetation zones in the development site using information obtained from the Threatened Species Profiles Database (TSPD) (Appendix P). It was found that 17 species have potential habitat in the Development Site and as such would be considered ecosystem credit species.

Of these species, one was recorded on or near the Development Site, namely Eastern Freetail-bat. Another two threatened ecosystem credit species not listed in the credit calculator were also recorded:

- Eastern Bentwing-bat.
- Little Bentwing-bat.

Calls of these three microchiropteran bat species were recorded in the south-east of the Development Site, near the boundary with Rawdon Creek Nature Reserve. Eastern Freetail-bat was also recorded in the west of the Proposal Site.

The threatened species with the highest Threatened Species (TS) offset multiplier in each vegetation zone determines the final ecosystem credit value for that zone. Powerful Owl and Sooty Owl each have a high offset multiplier score of 3.0; this score is only relevant to breeding habitat containing large tree hollows, which does not occur in the Development Site. As such, the offset multiplier has been lowered to 1.5 for these species, in accordance with the Biobanking Assessment Methodology (BBAM).

Species credit species

Flora

The following threatened flora species listed under the TSC Act were identified in the credit calculator as predicted flora species credit species:

- *Dracophyllum macranthum*
- Slender Marsdenia (*Marsdenia longiloba*)
- Biconvex Paperbark (*Melaleuca biconvexa*)
- Groves Paperbark (*Melaleuca groveana*)
- Rusty Plum, Plum Boxwood (*Niemeyera whitei*)
- Scant Pomaderris (*Pomaderris queenslandica*)
- Rainforest Cassia (*Senna acclinis*).

Each species has been assessed for potential presence on the development site using information obtained from the TSPD (refer to Appendix P).

No threatened flora species credit species were recorded within the Development Site and none are likely to occur due to the absence of habitat.

Fauna

The following were identified in the credit calculator as predicted fauna species credit species:

- Brush-tailed Phascogale (*Phascogale tapoatafa*)
- Common Planigale (*Planigale maculata*)
- Eastern Chestnut Mouse (*Pseudomys gracilicaudatus*)
- Eastern Pygmy-possum (*Cercartetus nanus*)
- Giant Barred Frog (*Mixophyes iteratus*)
- Green-thighed Frog (*Litoria brevipalmata*)
- Koala (*Phascolarctos cinereus*)
- Pale-headed Snake (*Hoplocephalus bitorquatus*)
- Pale-vented Bush-hen (*Amaurornis moluccana*)

- Regent Honeyeater (*Anthochaera phrygia*)
- Rufous Bettong (*Aepyprymnus rufescens*)
- Squirrel Glider (*Petaurus norfolcensis*)
- Stephens Banded Snake (*Hoplocephalus stephensii*)
- Three-toed Snake-tooth Skink (*Coeranoscincus reticulatus*)
- White-eared Monarch (*Carterornis leucotis*).

Each species has been assessed for potential presence on the development site using information obtained from the TSPD (refer to Appendix P). Targeted survey methods and timing for each identified species is noted and an assessment of the presence status of each species was determined based on targeted survey results and habitat presence.

Two species credit species in the list generated by the Major Projects calculator were recorded in the Development Site: Koala (*Phascolarctos cinereus*) and, tentatively, Green-thighed Frog (*Litoria brevipalmata*). Three areas within the study area were identified as supporting Koala feed trees; one of these encompasses the Development Site (Figure 8-6).

There was a tentative sighting of Green-thighed Frog in the drainage line in the north-west of the Proposal Site: a frog that appeared to meet the description of the species was briefly observed during diurnal surveys, however it was not seen for long enough for the identification to be confirmed. Based on the numerous recent records of the species in the locality and the presence of potential suitable habitat for the species within the Development Site, it is assumed to be present. Habitat specified in the TSPD for this species is 'land within 300 m of semi-permanent or ephemeral ponds or depressions containing leaf litter'.

Calls of Southern Myotis were recorded in the south-east of the Development Site, near the boundary with Rawdon Creek Nature Reserve. Southern Myotis was not in the list generated by the Major Projects calculator. Southern Myotis is classed as both an ecosystem and species credit species; species credits only apply to areas of potential breeding habitat, which for this species is defined in the TSPD as 'hollow-bearing trees, bridges, caves or artificial structures within 200 m of a riparian zone'.

Matters of National Environmental Significance

An assessment of the likelihood of occurrence of threatened flora and fauna species listed under the EPBC Act in the Development Site was undertaken. A search of the Department of Energy and Environment (DoEE) Protected Matters Search Tool (6 February 2017) found 10 threatened flora species and 43 threatened fauna species listed under the EPBC Act that are known or likely to occur within 10 kilometres of the Development Site.

Only one threatened flora species listed under the EPBC Act, *Cynanchum elegans* (White-flowered Wax Plant) was found to have a moderate likelihood of occurrence in the Development Site. An Assessment of Significance was undertaken in Appendix P and found that impacts to this species would not be significant. A Referral to the Minister of the DoEE is therefore not required. The other nine threatened flora species identified in the search were found to have a low likelihood of occurrence.

When species restricted to marine environments were excluded, there were 17 threatened fauna species listed under the EPBC Act known or likely to occur within 10 kilometres of the Proposal Site. Of these, one is known on the Development Site (Koala), two (Spotted-tail Quoll and Grey-headed Flying-fox) are considered to have a high likelihood of occurrence, and one (Giant Barred Frog) is considered to have a moderate likelihood of occurrence.

Two MNES were recorded in the Development Site: Koala (*Phascolarctos cinereus*), listed as Vulnerable under the EPBC Act, and the Rufous Fantail (*Rhipidura rufifrons*), listed as Migratory under the EPBC Act.

Assessments of Significance for the Koala, Spot-tailed Quoll, Grey-headed Flying-fox, Giant Barred Frog and Rufous Fantail were undertaken in Appendix P. No impacts were found to be significant for any of the species and as such, a referral to the Minister of the DoEE is not required.

In addition, a review of the site information and the EPBC Act referral guidelines for the vulnerable Koala (Commonwealth of Australia 2014) by Biolink Ecological Consultants (Appendix P) found that:

- Activity on the site is likely to involve transient use by an individual as opposed to the presence of a resident population of several koalas
- The subject site and the immediate surrounding vegetation is not large enough in size nor of an adequate stage of growth/quality to support a resident population of koalas
- Any risk that the removal of vegetation at the site would result in a reduction in the overall area of occupancy of the remaining, broader koala population is negligible.

It was concluded that an EPBC referral for the species was not required.

8.2.3 **Assessment of impacts**

As described in Section 5.1, the Proposal would involve the progressive construction, operation and rehabilitation of three landfill stages, following a staged approach. Likely impacts from the Proposal include:

- Loss of 3.4 hectares of native vegetation of the PCT Blackbutt - Pink Bloodwood shrubby open forest of the coastal lowlands of the NSW North Coast Bioregion
- Loss of 3.4 hectares of terrestrial fauna habitat including habitat for threatened and migratory species
- Habitat fragmentation/ loss of fauna habitat connectivity
- Impacts to GDEs
- Fauna mortality
- Edge effects and weed invasion
- Alteration to air quality and noise levels
- Indirect impacts.

Impacts requiring offset determination

Under the NSW Biodiversity Offsets Policy for Major Projects, a biobanking agreement is required to be used to secure an offset site. The ecosystem and species credit offset requirements for the biodiversity impacts of the Proposal are detailed below.

Impacts on native vegetation

Loss of landscape and site value for the PCT and its associated ecosystem species, as determined using the credit calculator, is presented in Table 8-5. The vegetation to be offset is shown in Figure 8-6. The full credit report is provided in Appendix P.

Table 8-5 Impact summary for PCTs and associated ecosystem credit species requiring offsets and their required credits

Vegetation zone	Associated EECs and/or threatened species	Loss in landscape value	Loss in site value score	Number of ecosystem credits required
Blackbutt - Pink Bloodwood shrubby open forest of the coastal lowlands of the NSW North Coast Bioregion (NR117): Moderate/Good	• Spotted-tailed Quoll	15.00	84.38	221

Impacts on threatened species

Impacts to threatened species credit species and their associated species are summarised in Table 8-6. The full credit report is provided in Appendix P.

Table 8-6 Impact summary for threatened species credit species requiring offsets and their required credits

Common name	Scientific name	Status	Impacts	Number of species credits required
Koala	*Phascolarctos cinereus*	Vulnerable	3.4 ha	84
Green-thighed Frog	*Litoria brevipalmata*	Vulnerable	3.4 ha	248
Southern Myotis	*Myotis macropus*	Vulnerable	0.12 ha	3

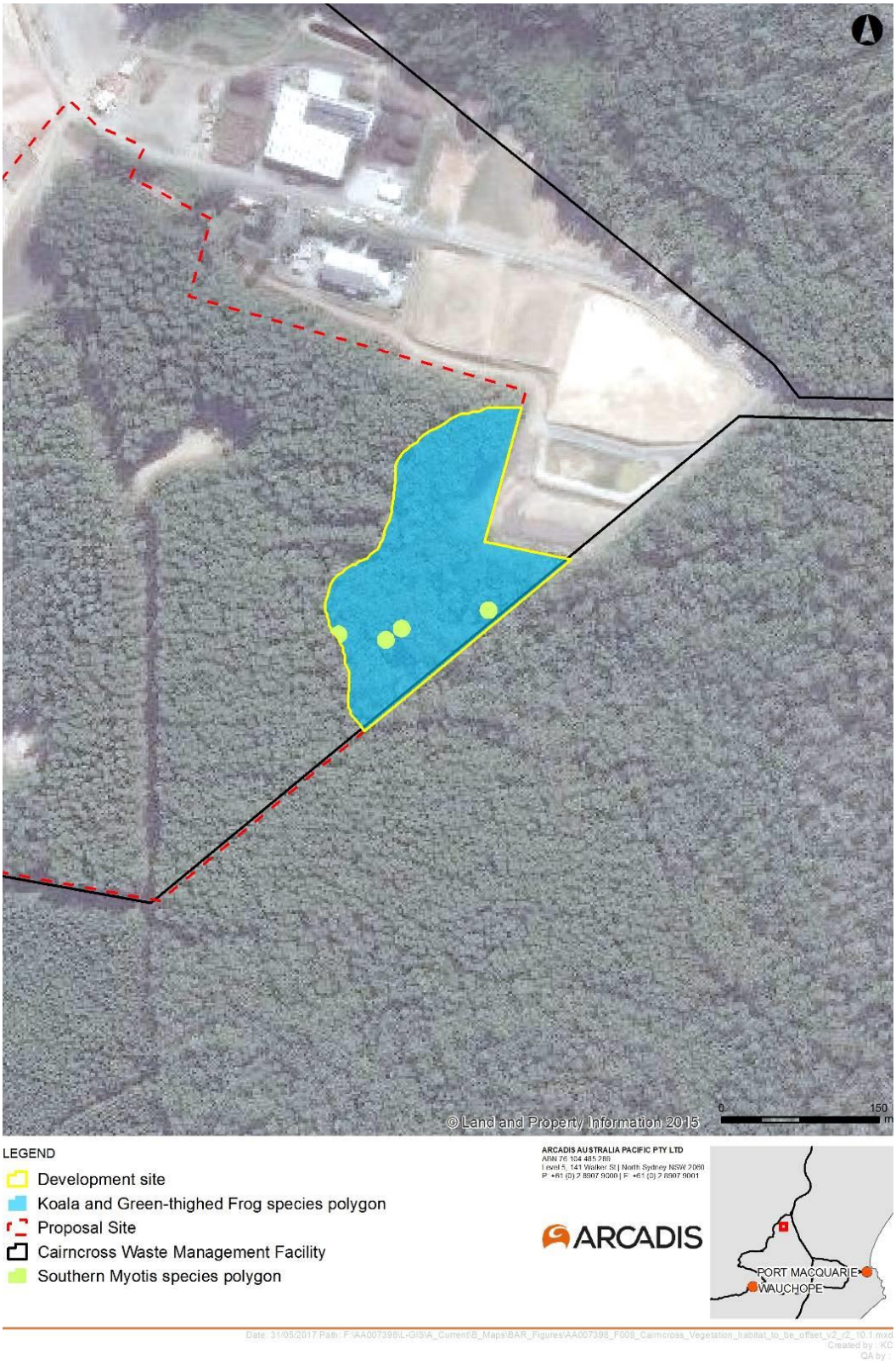


Figure 8-6 Vegetation/habitat to be offset

Koala connectivity corridor

A Koala connectivity corridor would be established to partially offset the impacts to Koala habitat as identified in Figure 8-7. The corridor would be approximately 50 metres wide and would run along the south-western border of the Proposal Site. Establishment of the Koala corridor would involve fencing off the Stage 2 landfill area adjacent to the corridor to prevent migration of Koalas onto the Proposal Site. In order to maintain connectivity, the Koala corridor would not be fenced on other sides. The embellishment of this habitat corridor with additional Koala food trees, and the control of all invasive weeds will be undertaken as part of Councils Public Bushland Management Programme. This area, plus the compensatory habitat to the west shown in Figure 8-7, are under Councils ownership and will be managed in perpetuity and rezoned for environmental protection with the next standard LEP instrument amendment by Council.

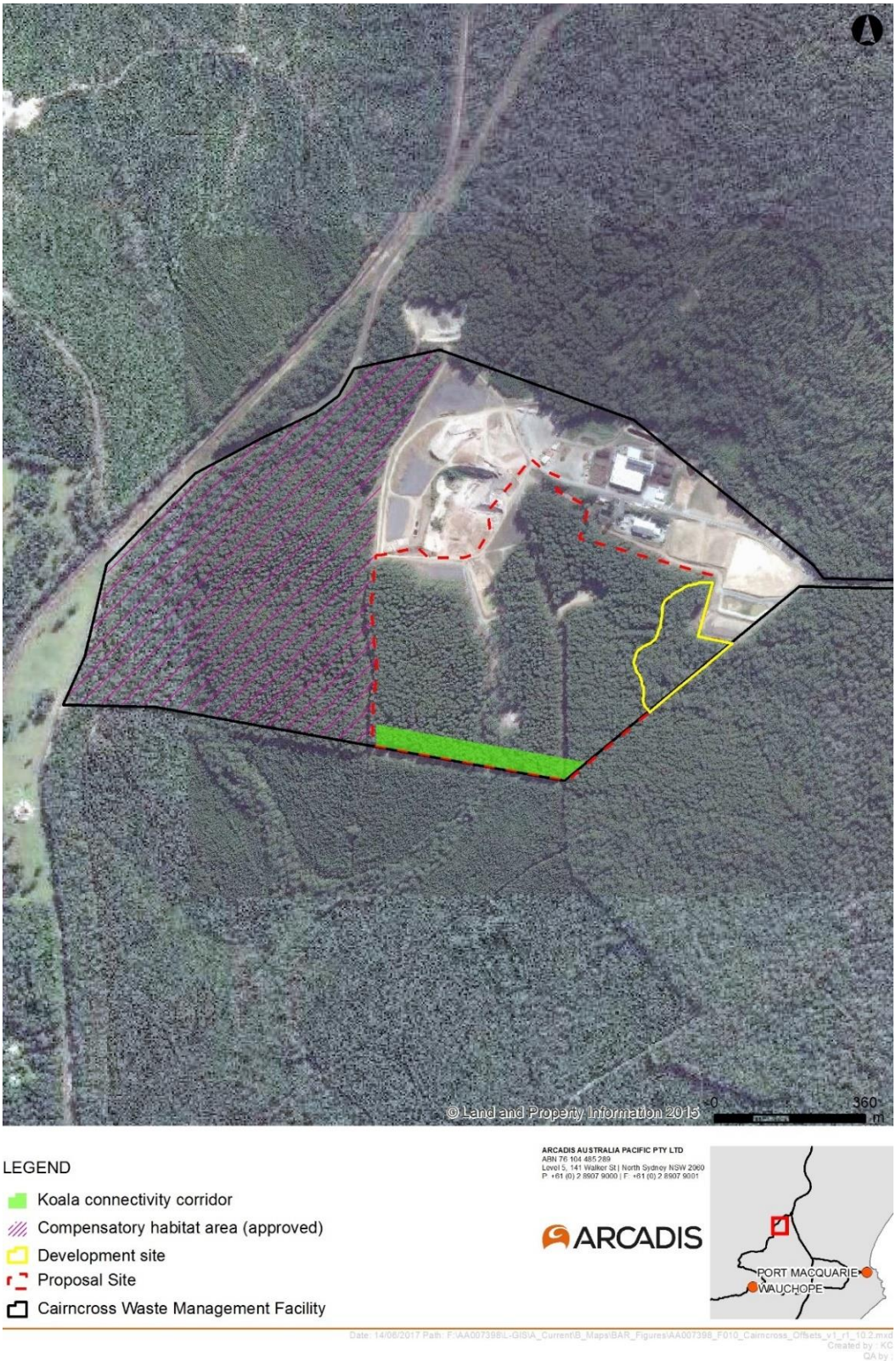


Figure 8-7 Koala connectivity corridor and approved compensatory habitat area

8.2.4 **Mitigation measures**

Table 8-7 provides a summary of the measures which would be implemented to mitigate biodiversity impacts during construction and operation of the Proposal. Mitigation of impacts relating to sedimentation and erosion (i.e. a reduction in water quality and degradation of downslope swamp forest habitats) are addressed in Section 8.4. Mitigation of impacts relating to dust and noise (i.e. disruption of fauna foraging, nesting or roosting behaviours) are addressed in Sections 8.6 and 8.7.

Table 8-7 Biodiversity mitigation measures

ID	Mitigation measure	Timing
FF-01	Clearing of vegetation and excavation activities would not be undertaken during overland flow events (where there is surface runoff present after rainfall and prior to entering a waterway).	Construction / operation
FF-02	Stabilisation of disturbed areas adjacent to retained native vegetation, including revegetation where appropriate, would be undertaken as soon as feasible and reasonable after disturbance.	Construction / operation
FF-03	A biobanking agreement would be established to secure an offset site Under the NSW Biodiversity Offsets Policy for Major Projects prior to clearing the 3.4 ha of native vegetation within the Stage 3 area. The offsets site would secure the ecosystem and species credit offset requirements outlined in Section 8.2.3. All offset land will be funded and managed in perpetuity under Councils Public Bushland Management Programme. Management actions would include, but not be limited to, the following: - Identification of type and location of weeds of concern within the site: - Identification of sensitive receivers (such as native vegetation and waterways) within or adjacent to the Proposal Site - Management and disposal of weeds (including declared noxious weeds) in accordance with requirements of the *Noxious Weeds Act 1993*.	Pre-construction / construction / operation Note: the offset site would need to be established prior to clearing the 3.4 ha of native vegetation within the Stage 3 area.
FF-04	Fauna microhabitat, such as logs, would be removed from areas to be cleared and relocated to suitable nearby habitat.	Pre-construction / construction
FF-05	Extent of clearing would be fenced with highly visible temporary fencing to ensure that clearing does not extend beyond the area necessary.	Pre-construction / construction
FF-06	A hollow replacement program would be implemented in the Koala corridor and on any proposed offset site. Hollows would be replaced at 1:1 ratio to offset the impacts to one small hollow, 10 medium hollows and five large hollows.	Pre-construction / construction

ID	Mitigation measure	Timing
FF-07	All injured fauna to be reported to the site manager. Contact details would be kept on site for the local animal rescue group (Fawna Wildlife Rescue, Port Macquarie) and veterinarian if any fauna are injured on site or require capture and/or relocation.	Pre-construction / construction / operation
FF-08	A two-stage clearing process will be implemented in areas of the Proposal site containing hollow-bearing trees. An experienced ecologist would be present on site to supervise all stages of removal of hollow bearing trees, as well as relocation of any fauna.	Pre-construction / construction / operation
FF-09	If feasible and reasonable, vegetation clearing should not be undertaken during the breeding seasons for threatened fauna species with potential habitat on the Development Site. This will not be possible for all identified threatened species as breeding seasons collectively span a large portion of the year. In order of preference of avoidance, the breeding periods are: - Koala – September to February (breeding season) - Glossy Black Cockatoo – March to August (breeding season) - Spotted-tail Quoll – June to January (maternal den season) - Grey-headed Flying Fox – October to March (breeding season) - Southern Myotis – November to February (breeding season) Scheduling the vegetation removal for Autumn months would generally avoid the breeding season of most species that could occur on site.	Pre-construction / construction
FF-10	The Koala connectivity corridor will be managed in perpetuity and rezoned for environmental protection with the next standard LEP instrument amendment by Council.	Construction / operation

8.3 Soil

The SEARs require that the EIS for the Proposal address potential impacts to soil, water and leachate. This section addresses the potential impacts to soils, including potential erosion and sedimentation impacts, as well as impacts associated with acid sulfate soils, salinity and soil contamination. Water and leachate impacts are addressed in Sections 8.4 and 8.5 respectively.

Table 8-8 provides a summary of the soil-related SEARs and where these have been addressed in this EIS.

Table 8-8 SEARs relevant to soils

SEAR	Where addressed in EIS?
Soil, Water and Leachate	
• The proposed erosion and sediment controls during construction and operation;	Section 5.4, 5.5 and 8.3.2
• Consideration of potential acid sulfate soils, salinity, soil contamination;	Section 8.3.1 and 8.3.2

8.3.1 Existing environment

Geology and soils

The underlying site soils at the Proposal Site are generally clayey with low permeability and high potential for runoff. The 1999 EIS noted that the residual clays have a low to moderate dispersive potential (ERM, 1999).

A geotechnical investigation was undertaken by GHD-Longmac Pty Ltd in 1998. The report (*Hydrogeological Investigation of Proposed Cairncross landfill*) described the regional geology as follows:

The regional geology within the vicinity of the site consists of Quartenary Alluvial material and sedimentary bedrock (Refer to the Tamworth-Hastings 1:250,000 metallogenic sheet). The Quaternary Alluvial material consists of mud, silt, sand and gravel deposits. The sedimentary bedrock consists of rock types of the early permian to carboniferous age of the Hastings Block. This comprises the Macleay Group, Byabarra beds, and the Youdale, Kullatine, Majors Creek, Mingaletta and Cooperabung formations. The rock types within these units include the lithic sandstone, mudstone, calcareous mudstone, siltstone, limestone, conglomerate and tuff.

The investigation revealed the following subsurface conditions for the landfill site:

- Topsoil of 0.1 metre to 0.2 metre depth was encountered across the site and consisted primarily of medium plasticity clay
- Residual clays of high plasticity were encountered to depths of 1.5 metres to 2.0 metres on the ridges, and up to 5.0 metres within the lower areas and gullies
- Siltstone bedrock was encountered below the residual clays across the site. The siltstone was generally highly weathered and very weak to weak in strength. The siltstone stratum was in the range of 4 metres to 5 metres thick
- Shale bedrock of weak to medium strength was encountered below the siltstone (PMHC, 2016).
- Excavation within Stage E of the landfill has found the sub-surface soils to be consistent with the geotechnical report by GHD-Longmac Pty Ltd, and therefore no

further geotechnical investigations were considered necessary for the concept design of future landfill stages (PMHC, 2016).

Acid sulfate soils

A search of the Australian Soil Resource Information System (CSIRO, 2017) identified that the Proposal Site is located in an area predicted to have a 'Low Probability' of acid sulfate soils (ASS). The search results are shown in Figure 8-8. The search results indicate a 'very low confidence' in the predicted occurrence of ASS. Elevations across the Proposal Site vary from approximately 50 metres Australian Height Datum (AHD) at the top of the ridge to the west to approximately 20 metres AHD along the south-east of the site. ASS are predominately encountered at <20m AHD. While excavation in the south-east of the site would extend to 18 metres AHD, no ASS has been identified during excavation of the Stage E landfill and ASS is not expected to be encountered in Stages 1-3 of the Proposal.

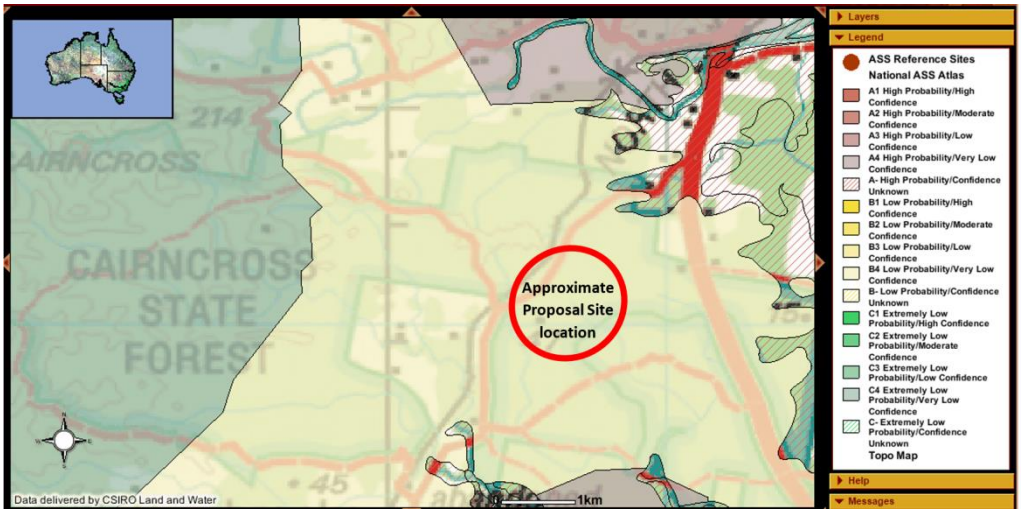


Figure 8-8 Acid sulfate soil mapping (CSIRO, 2017)

Salinity

According to the *Land and Soil Capability Dataset* (OEH, 2013a), the Proposal Site is classified with a salinity score of 1 out of 8 (where 8 represents the worst limitations due to salinity). A salinity score of 1 is described as having "Very slight to negligible limitations". Land capable of sustaining high impact land uses and no special management practices required" (OEH, 2013a). The salinity mapping for the site is shown in Figure 8-9.

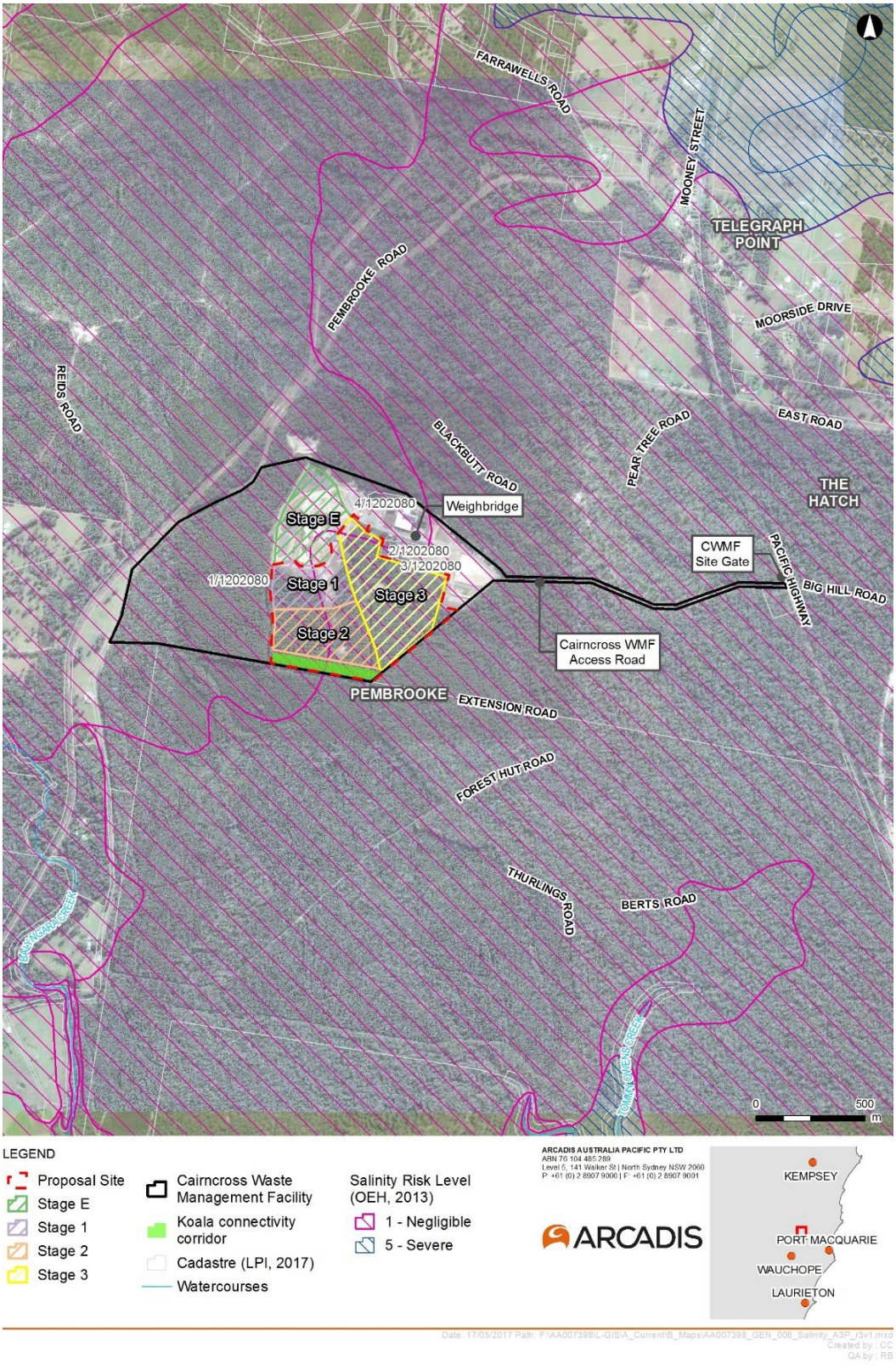


Figure 8-9 Salinity risk (OEH, 2013)

Site history and potential for contamination

The site history has been reviewed to determine the likelihood of contamination on the Proposal Site. The original vegetation on the Proposal Site was native hardwood forest which was harvested for railway sleepers from the early 1900s (pers. comms., PMHC / Mick Wilson, NSW Forestry Corporation). This vegetation was subsequently cleared to make way for hardwood forestry plantations established between 1976 and 1977s (ERM Mitchell McCotter, 2000). The plantation forest continues to cover the majority of the Proposal Site, with a small area (approximately 3.4 hectares) in the south-east of the site containing native vegetation. The history of the Proposal Site as a State Forest plantation/containing native vegetation provides an assurance that there is a very low probability that soil contamination problems will be encountered (PMHC, 1999). Excavation within the broader Cairncross WMF, including in the Stage E landfill area, has not uncovered any contaminated materials.

As the Proposal Site is located immediately adjacent to and downgradient of the Stage E landfill, there is the potential for soils at the Proposal Site to have become contaminated from transport of leachate from the Stage E area. Environmental management of the Stage E landfill has included avoidance of contamination, in particular through leachate collection and management, and has been governed by the site specific OEMP (PMHC, 2008). Groundwater monitoring for Stage E has shown that there is presently no mixing of leachate with groundwater at the site (Trace Environmental, 2016). Therefore, the potential for any soil contamination impacts from the Stage E landfill on the Proposal Site is predicted to be low.

A search of the *NSW Contaminated Land Public Record* (NSW EPA, 2017a) (maintained by the NSW EPA under section 58 of the CLM Act) found no records of contaminated sites within the PMHC LGA (see Appendix L). A search of the *List of NSW Contaminated Sites Notified to EPA* (undertaken 16 March 2017) (NSW EPA, 2017b) (Appendix N) identified 11 contaminated sites within the PMHC LGA. The majority of these sites were petrol stations and none of the sites is within, adjacent to or within close proximity of the Proposal Site.

A search of the NSW EPA POEO Act public register of licence, applications and notices was undertaken on 17 March 2017 for Telegraph Point, NSW. The search results listed 10 entries, all of which relate to the Cairncross WMF EPL (initial issue of EPL and subsequent variations) (Appendix M).

Sensitive receiving environments

Sensitive receiving environments in the vicinity of the Proposal Site that could be affected by potential soil impacts include:

- Downstream waterways including Rawdon Creek (approximately two kilometres to the south) and the Hastings River (approximately six kilometres to the south-east)
- The Rawdon Creek Nature Reserve (managed by the NSW Office of Environment and Heritage) and the Cairncross State Forest.
- Potential impacts from the Proposal on these sensitive receiving environments are discussed in Section 8.3.2.

8.3.2 Assessment of impacts

Erosion, sedimentation and contamination

Construction and operation of the Proposal would involve clearing of vegetation and significant earthmoving activities (see the earthworks and materials balance in Section 5.1.6) which will expose the soil and increase the risk of erosion and sedimentation. Earthmoving will occur during all stages of the Proposal including during excavation of the landfill cells, installation of the leachate barrier system, and during daily, intermediate and final landfill covering activities. Overall, the Proposal is expected to generate approximately 186,000 metres^3 of surplus soils (see

Section 5.1.6). This material would be stockpiled within the Proposal Site prior to being exported from the site for use in other approved projects. Whilst material is stockpiled on site there is the potential for erosion and sedimentation from these stockpiles.

If inappropriately managed, eroded sediments can be transported downstream and be deposited on vegetation and in creeks, rivers, wetlands and other aquatic habitats (OEH, 2013b). These changes can result in damage to downstream aquatic habitats by scouring the bed and banks of watercourses, altering water quality and smothering sensitive areas (OEH, 2013b).

The landfill will receive general solid waste (i.e. putrescible and non-putrescible materials) and asbestos from domestic and C&I sources.

The potential soil impacts associated with these activities include erosion and sedimentation (via wind and water) and generation of leachate which, if inappropriately managed, can result in soil/groundwater contamination. These impacts have the potential to affect the surrounding sensitive receiving environments identified above.

The large area of disturbance required at the site and timeframe for construction of the Proposal means there is a high potential for erosion from the Proposal site, if not properly managed. Likewise, the Proposal is expected to receive approximately 3.2 million tonnes of waste over the life of the landfill which has the potential to generate significant volumes of leachate which presents a high risk of contamination if not properly managed.

Acknowledging the high risk for potential soil erosion and contamination, the Proposal has been designed in line with best practice procedures and in consideration of the 2016 Landfill Guidelines. Provided the Proposal is constructed and operated in accordance with the Proposal Description, including the Stormwater Management Strategy (SMS) and leachate management design (Section 5) the potential for soil erosion and contamination impacts are considered to be low.

Following landfill closure, installation of the final landfill cap and establishment of the revegetation layer (as described in Section 5), the ongoing potential for soil impacts from the Proposal will be low.

Based on the site history (see Section 8.3.1) there is a very low likelihood for existing soil contamination on the Proposal Site.

8.3.3 Mitigation measures

Table 8-9 identifies safeguards and management measures that will be implemented to address potential soil impacts associated with the Proposal. Safeguards and management measures are recommended in line with the relevant objectives and principles set out in the 1999 EIS and the Cairncross WMF OEMP (PMHC, 2008).

Soil related impacts (including soil erosion, sedimentation and the potential for soil contamination) would be managed through the implementation of the Proposal in accordance with the Proposal Description, including the SMS and leachate management design (Section 5). The aim of these measures is to avoid a reduction in water quality exiting the Proposal Site and prevent soil and groundwater contamination from leachate migration. A water quality monitoring program would be implemented for the Proposal to monitor the effectiveness of these measures in achieving this objective. Water quality and leachate mitigation measures, including the proposed water quality monitoring program, are outlined in Sections 8.4 and 8.5.

Table 8-9 Soil mitigation measures

ID	Mitigation measures	Timing
S-01	A detailed ESCP would be developed, to cover both construction and operation of the Proposal, in accordance with the Blue Book, including: – Installation of erosion and sediment controls prior to construction commencing – Separation of clean and dirty water – Minimisation of ground disturbance and areas of exposed soils, where possible – Stabilisation and revegetation of exposed soils as soon as practicable – Avoidance/minimisation of clearing and earthworks during periods of heavy rain – Measures to reduce the velocity and erodibility of surface water flows across the site – Measures for management of stockpiles and sediment basins – Requirements for classification of surplus excavated materials under the NSW EPA *Waste Classification Guidelines 2014*.	Pre-construction / construction / operation

8.4 Water

The SEARs require that the EIS for the Proposal address potential impacts related to water (including surface water and groundwater). Table 8-10 provides a summary of the relevant SEARs and where these have been addressed in this EIS.

Table 8-10 SEARs relevant to water

SEAR	Where addressed in EIS?
Soil, Water and Leachate	
- a site water balance, including a detailed description of the measures to minimise the water use at the site	Section 8.4.2
- a detailed assessment of the potential impacts of the project on the quantity, quality and long-term integrity of the surface and groundwater resources in the area, including baseline data of existing conditions, potential flooding impacts and potential impacts on Rawdon Creek	Section 8.4.1, 8.4.2
- the proposed stormwater management system, including the capacity of onsite detention systems, and measures to treat, reuse or dispose of water	Section 8.4.2

8.4.1 Existing environment

Surface water

Drainage and topography

The Proposal Site drains via two ephemeral watercourses; one flows directly to Rawdon Creek and the other flows into Tommy Owens Creek which is a tributary of Rawdon Creek. Rawdon Creek forms part of the Hastings River catchment. Rawdon Creek is located approximately two kilometres to the south of the Proposal Site and the Hastings River is located approximately six kilometres to the south-east of the Proposal Site.

The overall drainage and topography of the Proposal Site itself is shown in Figure *8-10*. The existing capped and grassed landfill area (Stage E) generally drains to the west and north via ephemeral gullies C and D. Once completed, the eastern corner of Stage E will drain to the existing firefighting storage and then into ephemeral gully B (PMHC, 2016). The Stage E operational area drains to Sediment Basin A which in turn discharges to ephemeral gully A.

To the south are the future landfill areas which slope to the south and south-east and are drained by ephemeral gullies A and B. Gullies A and B both drain to Rawdon Creek via ephemeral watercourses and join approximately two kilometres to the south of the Cairncross WMF (PMHC, 2016). Site slopes are generally in the range of 1% to 10%. The majority of the Proposal Site is currently vegetated.

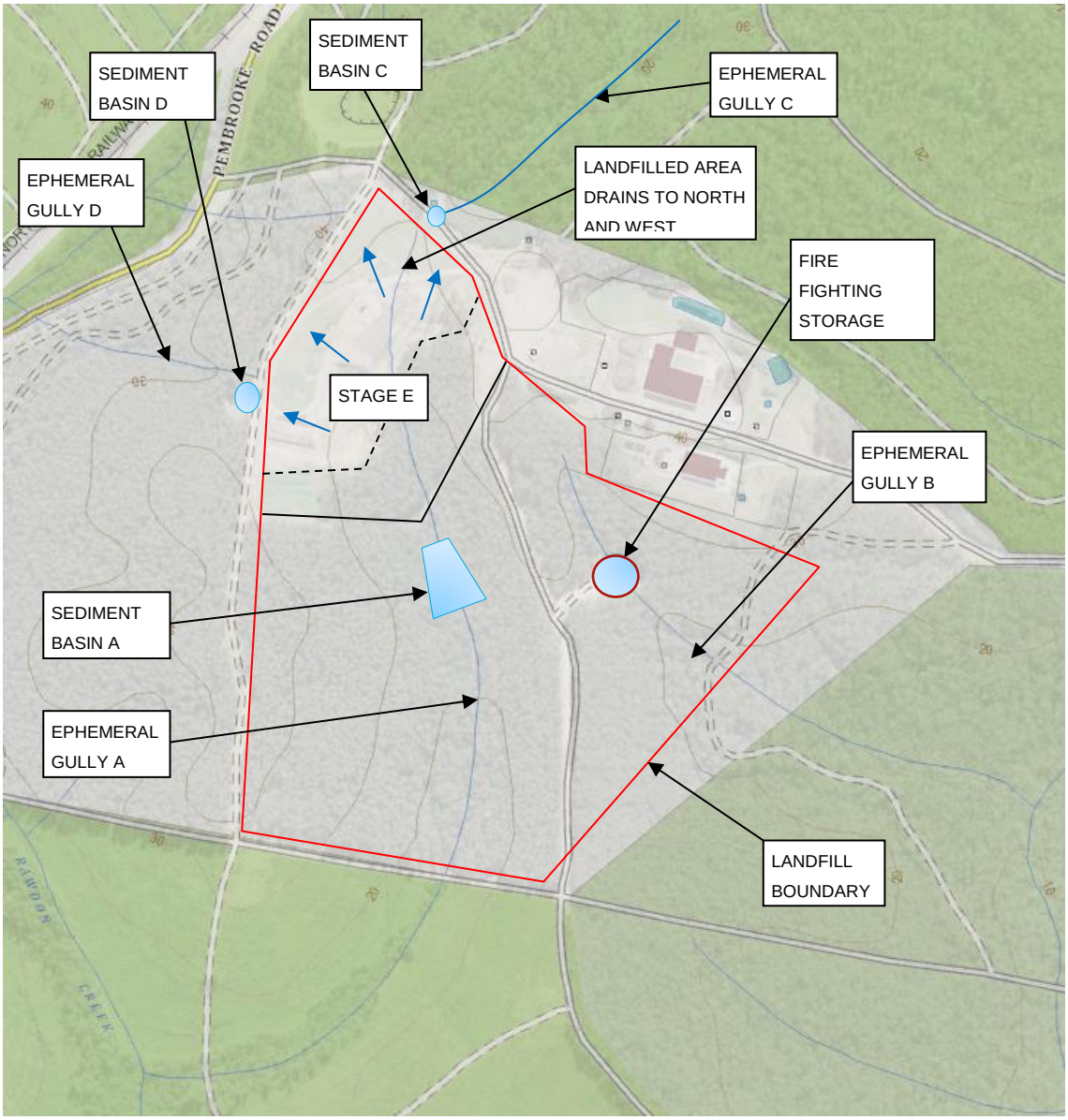


Figure 8-10 Site drainage and topography (Six Maps, 2016) (PMHC, 2016)

Flooding

The *Hastings River Flood Study* (Patterson Britton & Partners, 2006) identifies the lower tributaries of Rawdon Creek as affected by flooding from the Hastings River during a 100 year average recurrence interval (ARI) flood event and Probable Maximum Flood (PMF). This flooding occurs approximately two kilometres downstream of the site and as such the site is considered flood free from river flooding (PMHC, 2016).

Baseline surface water quality

The water quality in the Hastings River catchment was monitored as part of the EcoHealth program over a 12-month sampling period in 2011-12. The EcoHealth program was run by the Northern Rivers Catchment Management Authority in conjunction with PMHC and a number of other partners.

The program assigned a river health 'grade' based on ratings from a high of 'A', through intermediate ratings of 'B', 'C' and 'D', to the lowest score of an 'E'. The rivers in the Hastings catchment received an overall grade of 'B-'; with good water quality and native fish populations, and fair riparian condition and waterbug diversity (Northern Rivers Catchment Management Authority, 2012). All estuary sites combined

in the Hastings catchment received a combined grade of C, with poor riparian and bank condition reducing the scores compared to sites upstream.

Surface water quality samples have been collected by PMHC generally on a quarterly basis over a period between September 2001 and March 2017. Two of these locations (CS8A and CS9 – see Figure 8-11) are relevant to the Proposal and a summary of the surface water quality results (minimum and maximum) are provided in Table 8-11.

Figure 8-11 Water quality monitoring locations

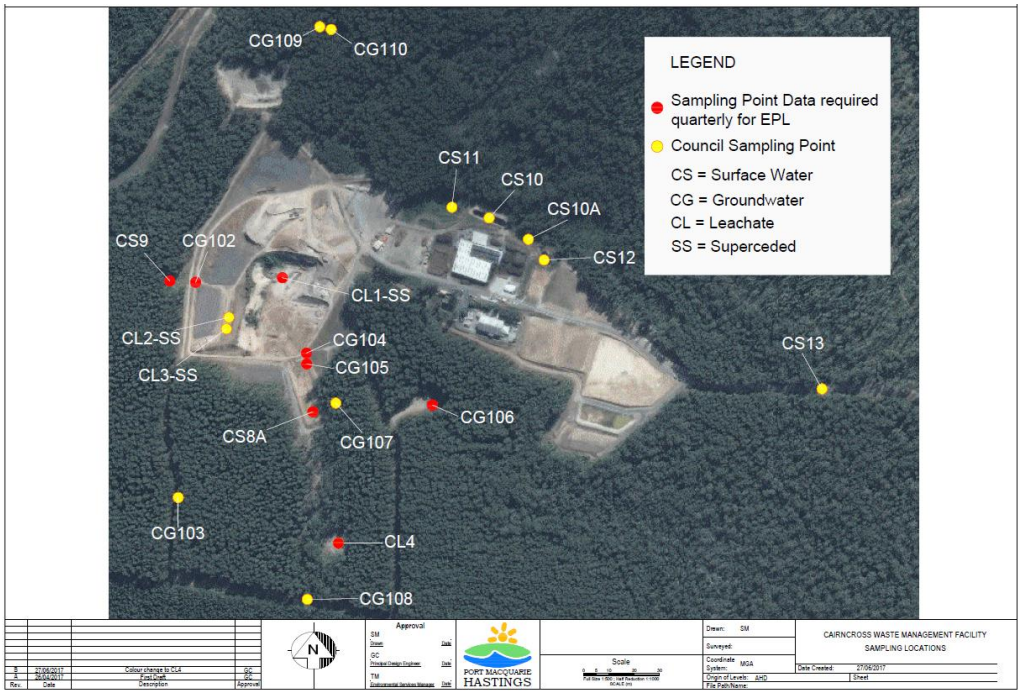


Table 8-11 Summary of surface water quality results at the Cairncross WMF from 2001-2017

Parameter	Units	Minimum	Maximum	Average	Median
pH	-	4.55	8.53	6.90	6.99
EC	µS/cm	55	6,900	1,031	609
Ammonia	mg/L	<0.01	146	5.80	0.25
Nitrate	mg/L	<0.01	228	7.73	0.17
Phenols	mg/L	<0.05	2.29	0.32	0.05
Iron	mg/L	<0.05	11.8	1.45	0.58
Manganese	mg/L	0.008	0.93	0.15	0.07
Suspended Solids	mg/L	<5	11,100	531	155
Magnesium	mg/L	1	120	13.8	6.0
Sodium	mg/L	9	1,880	176	57
Potassium	mg/L	<1	656	59	20

Parameter	Units	Minimum	Maximum	Average	Median
Alkalinity (CaCO3)	mg/L	<1	889	92	11
Sulfate	mg/L	<1	124	42	33
Chloride	mg/L	11	1,910	219	90
Nitrite	mg/L	<0.01	0.07	0.03	0.02
Total Halogenated Hydrocarbons	µg/L	<5	<50	-	-

The surface water is generally near neutral pH, with the average and median pH values reported between 6.9 and 6.99. The *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC and ARMCANZ, 2000) (ANZECC Guideline) values for 95% protection of freshwater species (ANZECC limits) for pH are from 6.5 to 8. Whilst the pH is typically near neutral, the surface water pH has varied between acidic conditions (minimum pH of 4.55) and alkaline conditions (maximum pH of 8.53), with 20 out of 44 records falling outside (above or below) the ANZECC Guideline limits.

The water is typically sodium chloride dominant, with median concentrations of ammonia and nitrate (which are key indicators of leachate) of 0.25mg/L and 0.17mg/L. These median concentrations of ammonia and nitrate are below the ANZECC Guideline limits (of 0.9mg/L and 0.7mg/L, respectively) and are unlikely to be representative of leachate impact. There have been occasions where elevated concentration of ammonia and nitrate were reported (maximum values of 146mg/L and 228mg/L respectively) which may be indicative of leachate. Ten out of the 44 ammonia records were above the ANZECC Guideline limit. Thirteen out of the 44 nitrate records were above the ANZECC Guideline limit.

Concentrations of phenols were generally the laboratory limit of reporting (LOR) with a median of <0.05mg/L. The average concentration was 0.32mg/L, which coincides with the ANZECC Guideline limit 0.32mg/L. There were several occasions (8 out of 44 sampling records) where elevated concentrations of phenols in surface water were reported (with a maximum reported concentration of 2.29mg/L). The elevated phenol concentrations typically coincided with elevated concentrations of ammonia and nitrate, suggesting mixing of surface water with leachate.

No halogenated hydrocarbons were reported above the laboratory LOR.

These results indicate the need for greater attention to the separation of clean and dirty water to ensure the appropriate water quality objectives are achieved. This has been addressed in the surface water management strategy for the Propsoal, as described in Section 5.3.2.

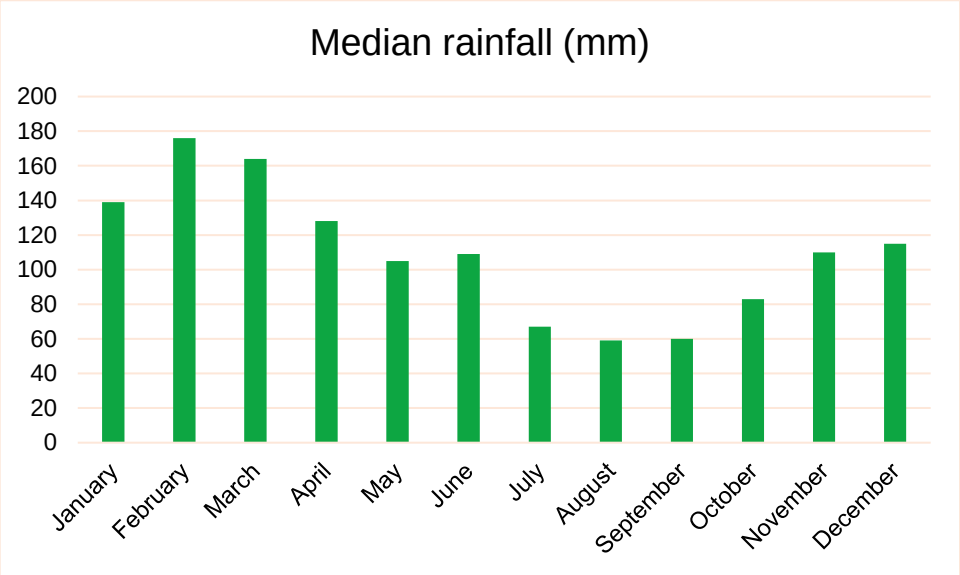
Water quality monitoring as part of the Proposal (see Section 8.4.3) would provide an ongoing mechanism for detecting mixing of surface water and leachate and will help inform ongoing water quality management strategies, including continued attention to the separation of clean and dirty water.

PMHC has recently made improvements to laboratory data recording and analysis procedures. Preliminary exceedance results will be flagged and notifications provided by laboratory staff to landfill staff as soon as possible following data processing (i.e. rather than awaiting the release of the final sampling results). This will enable improved on-site responsiveness to exceedances and improved management of leachate and surface water separation measures.

Climate

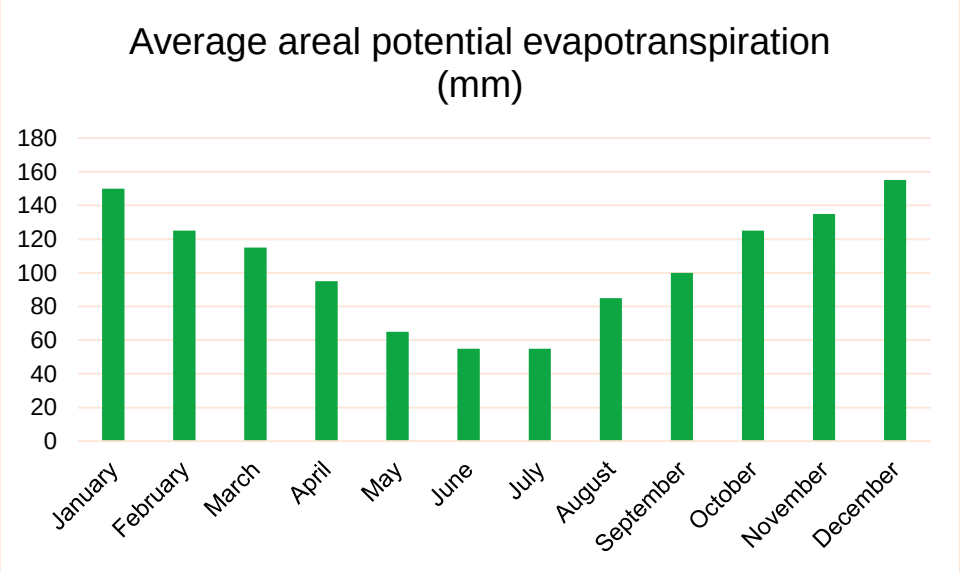
The Port Macquarie-Hastings area has a warm temperate climate with warm wet summers and mild dry winters. The closest historical rainfall gauge is located at Farawells Road, Telegraph Point (Bureau of Meteorology (BOM) Station 60031). The average annual rainfall for this gauge is 1,317 millimetres. The mean monthly rainfall is shown in Figure 8-12.

Figure 8-12 Mean Monthly Rainfall - Telegraph Point



Average areal potential evapotranspiration for the site has been estimated from BOM online mapping and is presented in Figure 8-13.

Figure 8-13 Average areal potential evapotranspiration (monthly)



The predominant winds on the site are from the north-east in the spring and summer and from the west and south-west during winter. Autumn is a transitional season with the majority of winds from the south and west.

Groundwater

The Proposal Site is located within the North Coast Porous and Fractured Rock Groundwater Sources. A Water Sharing Plan has been in place for this system under

the WMA 2000 since July 2016. A description of the hydrogeology and groundwater quality is provided below.

Hydrogeology

A hydrogeological assessment for the site was completed by Trace Environmental (*Hydrogeological Assessment - Cairncross Landfill Expansion*) (Hydrogeological Assessment) in October 2016 (Appendix F). The report considered monitoring data up until, and including, February 2016.

The assessment addressed the following:

- Regional and local groundwater system characterisation
- Details of the existing and future proposed site monitoring network and monitoring program
- Assessment of the predicted inflow rates into the proposed landfill cells
- Impact of the proposed landfill expansion on groundwater heads and groundwater quality on the groundwater systems, ecosystems, surface water system (Rawdon Creek) and groundwater users.
- Landfill design with respect to groundwater.
- Description of trigger levels for groundwater quality and head monitoring.
- Recommendations for future monitoring and reporting.
- Project compliance with State and Commonwealth regulations.
- A summary of the findings is presented below:
  - Three geological units are identified within the landfill site, namely clay/colluvium (silty clay), weathered rock (siltstone) and fractured rock (shale).
  - The weathered rock and fractured rock represent one hydrostratigraphic unit.
  - The clay is discontinuous across the site. Its major characteristic is the retardation of recharge to the underlying aquifer.
  - Groundwater recharge occurs via minor seepage through the clay or lateral flow through the shale/siltstone unit. The groundwater flow direction is from the north and west to the east and south-east, with average velocity of 0.008m/day.
  - Based on the groundwater chemistry it is concluded that there is presently no mixing of leachate with groundwater.
  - Identified sensitive receptors within a three kilometre radius of the landfill are private groundwater bores, surface water bodies, and areas with moderate potential for groundwater interaction with the presence of surface Groundwater Dependent Ecosystems (GDEs) that rely on subsurface expression of groundwater.

Baseline groundwater quality

Groundwater quality monitoring data from 2010/2011 relevant to Stage E was reported in the *Water Quality Monitoring Summary Report for Dunbogan, Port Macquarie, Wauchope and Cairncross landfills for the 2010 and 2011 License Period* (Connor and Smith, 2012). The report noted higher than normal levels for a number of parameters including Iron, Potassium, Ammonia and Nitrate. While levels returned to within historical ranges in subsequent monitoring, the report recommended further investigation to determine the cause of these results.

The Hydrogeological Assessment (Trace Environmental, 2016) (Appendix F) found that:

> *The groundwater chemistry indicates that a single groundwater type can be identified across the site, with water being brackish and having*

> *heavy metal and nutrient concentrations below the ANZECC (2000) guideline values for 95% protection of freshwater species. Geochemical characteristics of the clay layer have not been investigated as this layer is spatially discontinuous.*
>
> *The Stage E landfill leachate has an entirely different chemical composition to groundwater with high salinity, high nutrient load and measurable phenol concentrations. Pre-operational baseline data has similar geochemical composition to groundwater collected over the past 15 years. Based on the chemistry of leachate and baseline groundwater data, it is concluded that there is presently no mixing of leachate with groundwater occurring at the site.*

It is noted that from November 2015, Trace Environmental commenced groundwater monitoring at the Proposal Site from November 2015 and prior to this the sampling was conducted by PMHC Environmental Laboratory. PMHC identified a change in sampling method from November 2015. Groundwater monitoring data collected at the Proposal site prior to November 2015 had been collected using bailers and with limited or no purging of wells. Data collected by Trace Environmental was obtained using low flow methods, including monitored purging. Sampling of water without purging can result in collection of non-representative samples because exposure to oxygen within the well will result in water chemistry changes (pH and dissolved oxygen in particular). This chemistry change will directly affect the dissolved contaminants in the water including ammonia and dissolved metals. The use of a bailer to sample can also result in entrainment of colloidal material and the disturbance and oxygenation of the water. Metals and organic compounds bind to colloidal clays and can then be detected in the water analysis giving falsely high concentrations. Volatile contaminants can be lost through the disturbance and oxygenation.

In the majority of wells there is no appreciable difference in reported concentrations obtained using the two methods. In CG107 and CG108 there is a clear increase in the reported ammonia concentration and the salinity corresponding with the sampling method change. In CG 108, the salinity measurements went from a consistent 200 µS/cm to around 4,000 µS/cm and the ammonia concentration from 0.1 mg/L or less to approximately 1.4 mg/L. In CG107 the ammonia concentration went from <0.05 mg/L prior to November 2015 to approximately 1 mg/L after, although no change in salinity was reported.

It is considered likely that these two wells may be prone to infiltration from surface water or precipitation and that the historical sampling was not representative of the formation water chemistry. The more recent measurements should be taken as representative. Note that leachate is discussed in Section 8.5 below and that representative leachate measurements at CL1 indicate ammonia in the leachate (used here as a tracer compound) is typically 1,000 – 1,300 mg/L. Concentrations of ammonia in groundwater in the order of 1 mg/L are not considered indicative of leakage of leachate as they represent less than 0.1% of the leachate concentration.

It is further noted that whilst ammonia, albeit at low concentrations, was reported in CG107 and CG108 downgradient of the existing cell, ammonia was not reported at concentrations above 0.1 mg/L in the boundary wells at the cell edge (CG104 and CG105, monitoring data post November 2015). These wells are hydraulically aligned with CG107 and CG108 and would be expected to report similar or higher ammonia concentrations to those observed in downgradient wells if there were a breach of containment. This has not been observed.

Groundwater quality samples have been collected during the period from December 2001 to March 2017. Between December 2001 and August 2015, groundwater samples were collected on a quarterly basis by PMHC Environmental Laboratory. Between November 2015 and March 2017, groundwater samples were collected on quarterly basis by Trace Environmental. Different sampling methods were used between the consultants over the two periods. A summary of the groundwater quality

results (minimum and maximum), separated into the two periods of different sampling methods, is provided in Table 8-12 below.

Table 8-12: Summary of groundwater quality results at the Cairncross WMF from 2001-2017 using different sampling methods

Parameter	Units	Dec 2001 – Aug 2015		Nov 2015 – Mar 2017	
		Min	Max	Min	Max
pH	-	4.9	7.8	5.3	7.6
EC	µS/cm	108	3,910	138	4,320
Ammonia	mg/L	0.01	3.08	0.01	1.73
Nitrate	mg/L	0.01	2.0	0.01	1.2
Phenols	mg/L	0.05	0.42	0.05	0.05
Iron	mg/L	0.02	16.2	0.05	4.37
Manganese	mg/L	0.001	4.32	0.001	2.6

Groundwater users

The Hydrogeological Assessment provided an overview of groundwater users in the vicinity of the Proposal Site. The following section is taken from the Trace Environmental (2016) report.

A search of private water bores within a three kilometre radius of the Proposal Site was undertaken using the Groundwater explorer (DPI Water and BOM database, 2015). The search yielded ten bores (excluding those associated with operation of the Proposal Site). The bores are installed to depths ranging from 23 to 67 metres and their purpose is mainly water supply, with one bore installed for stock and domestic purpose. All bores are installed in hard rock aquifers either shale or basalt, with the yield ranging from 0.5 to 2.5 L/s. The salinity water quality is marginal to brackish, ranging from 700 to 2500 mg/L. The DPI Water database does not specify the purpose of those bores, however based on the salinity levels, the water is not suitable for drinking purposes (Trace Environmental, 2016).

Groundwater dependent ecosystems

The Hydrogeological Assessment provided an overview of groundwater dependent ecosystems (GDEs) in the vicinity of the Proposal Site. The following section is taken from the Trace environmental (2016) report.

The National Atlas of Groundwater Dependent Ecosystems (BoM, 2012) (GDE Atlas) presents the current knowledge and provides the most comprehensive inventory of the location and characteristics of groundwater dependent ecosystems across Australia. The GDE Atlas was consulted to check the presence of any GDEs in the vicinity of the Proposal Site.

The Atlas shows ecosystems including springs, wetlands, rivers and vegetation that interact with:

- The subsurface presence of groundwater
- Other surface expression of groundwater.

In the vicinity of the Proposal Site, there are no ecosystems that interact with a surface expression of groundwater. However, the Proposal Site and surrounding area has been classified as having either a “moderate or high potential for groundwater interaction” with the presence of “surface GDEs that rely on the subsurface expression of groundwater” (Bureau of Meteorology, 2012).

Sensitive receiving environments

Sensitive receiving environments within the vicinity of the Proposal Site that could be affected by potential impacts to surface or groundwater include:

- Downstream waterways including Rawdon Creek and the Hastings River
- The Rawdon Creek Nature Reserve (managed by the NSW National Parks and Wildlife Service) and the Cairncross State Forest
- Potential groundwater dependant ecosystems
- Private groundwater bores.

Potential water-related impacts on these sensitive receiving environments are discussed below.

8.4.2 **Assessment of impacts**

The Proposal has the potential to result in impacts to surface and groundwater including changes to the local hydrology, site water balance, water quality and impacts to the surrounding sensitive receiving environments. The potential impacts are discussed below.

Surface water

Altered hydrology

The Proposal involves clearing of vegetation on the site and alterations to landform. This has the potential to result in altered hydrology, in terms of both volumes and velocity of runoff generated from the site. An analysis of the performance of the sediment basins for Stages 1, 2 and 3, with respect to pre and post development flows from the site, was undertaken by PMHC using *DRAINS* stormwater modelling software. The following information is drawn from the Concept Design Report (Appendix B).

During construction and operation of the Proposal, on-site detention (OSD) basins will be used to capture and treat surface water runoff. The sediment basins have generally been designed to provide for effective on-site detention in events up to the 100 year ARI for Stages 1 and 3, and up to the 10 year ARI for Stage 2 (PMHC, 2016).

The post development peak flows for storm events between the 1 and 5 year ARI are estimated to generally reduce in the range of -5% to -85%. The greatest reduction in peak flow is estimated for very frequent events such as the 1 and 2 year ARI events. Stage 2 post development velocities will increase by between 10% (in a 20 year ARI storm event) and 18% (in a 100 year ARI storm event). Due to the infrequent nature of these major events, and the estimated minor increase in peak flow, the sediment basin design is considered appropriate in terms of providing sediment control and OSD (PMHC, 2016). Spillways are to be provided to the sediment basins and designed for major storm events (up to 100 year ARI).

These changes to peak flows (both increases and decreases) can impact water quality (through potential erosion/scour in higher peak flows and through altered flow regimes in lower peak flows) and can have flow on effects on downstream

environments. Changes to the local hydrology have been minimised as far as practicable while managing the need for erosion and sediment control on the site.

The final landform (see Figure 5-10) will redirect stormwater runoff from the western ephemeral gully (A) to the eastern ephemeral gully (B). At the completion of filling operations approximately 4.3 hectares will be redirected from the eastern ephemeral gully A catchment to the eastern ephemeral gully B catchment. This small redirection of stormwater runoff is not considered to be significant and not expected to impact the downstream environments given both gullies (A) and (B) ultimately drain to Rawdon Creek approximately two kilometres to the south of the Cairncross WMF via generally ephemeral watercourses. In addition, the overall catchment size is approximately 1,000 ha, and the redirection of 4.3 hectares represents only a 0.4 per cent reduction in the catchment size.

Water balance

Arcadis completed a water balance investigation for the expansion of CWMF (*Memo - Carincross Landfill Expansion - Site Water Balance*, August 2016) (Appendix G). The water balance considered rainfall and runoff for the existing and proposed stormwater storage basins within the site, along with the water demands on the site for dust suppression and fire fighting storage. The results of the water balance are summarised in *Table 8-13* and the extract below:

> *The results show that, in all months with average rainfall conditions, there is a surplus of water available for dust suppression. This applies throughout all stages of the proposed landfill operation. Under average rainfall conditions, the driest month is September, and this corresponds with the minimum surplus of approximately 200 m³/month during Stage 1, for the fire fighting storage dam on its own. If all four basins are considered, there is a surplus of more than 4,600 m³ across the site for the same month.*
>
> *The results also show that under 10th percentile rainfall conditions there is a potential water deficit during July and August in all three stages. A deficit of similar magnitude is also predicted by the water balance for the existing landfill for 10th percentile rainfall conditions. Discussions with Council identified that a water deficit has not previously been experienced at the landfill, even when there have been serious rainfall deficiencies (eg; August and September 2009 were consecutive months of less than 10th percentile rainfall). This is most likely due to the significant water storage provided in the existing basins. The existing fire fighting basin alone has a storage volume of approximately 3,000 m³, which is well in excess of the required fire fighting storage requirement of 100 m³ and also the maximum monthly water demand of 1,200 m³. The minimum proposed total water storage capacity, including settling zone volume within the sediment basins which could also be used as a water source, is approximately 8,300 m³ (during Stage 3)* (Arcadis, 2016).

Table 8-13 Water balance summary: maximum water demand and minimum water storage volumes

Maximum monthly water demand	Firefighting water storage requirements	Minimum proposed total water storage capacity
1,200 m³	100 m³	8,300 m³

The investigation found that a water deficit is considered unlikely to occur except in extreme drought conditions, and could be mitigated by the ability to draw water from all storage basins and/or mains water if no alternative is available.

Surface water quality

The Proposal has the potential to result in surface water quality impacts from soil erosion and sedimentation (as discussed in Section 8.3) and as a result of contamination from leachate (as discussed in Section 8.5). This could result in impacts to downstream environments including vegetation, creeks, rivers, wetlands and other aquatic habitats. In particular, this could impact the sensitive receiving environments identified above: including Rawdon Creek, the Hastings River, the Rawdon Creek Nature Reserve and the Cairncross State Forest.

The Proposal has been designed to take into account the potential water quality risks. A core element of the Proposal is the detailed Stormwater Management Strategy (SMS) (Section 5.3) which includes measures to minimise erosion and manage sedimentation and avoid surface water being contaminated by leachate. Clean surface water would be diverted around the active landfill site and any water coming into contact with waste would be treated as leachate. Sedimentation basins also form a key component of the SMS and will be operated to reduce the transfer of sediments outside the Proposal Site.

Given the proximity of the Rawdon Creek Nature Reserve (located immediately downstream of the Stage 3 landfill area), particular attention has been given to the measures to avoid water quality impacts on the reserve. A combined sediment basin and fire-fighting storage dam would be located on the southern boundary of the Stage 3 landfill area, adjacent to the nature reserve. The basin has been designed to capture and treat all sediment-laden runoff during a 90th-percentile 5-day rainfall event, as recommended by *Managing Urban Stormwater: Soils and Construction Volume 2B Waste Landfills* (the Blue Book).

Surface water quality could also be impacted during construction or operation of the Proposal due to the spillage of hazardous materials and substances (e.g. oil and petrol) in the waste vehicles accessing the landfill. The potential for such an impact is considered low.

Potential water quality impacts are considered unlikely provided the Proposal is implemented in accordance with the design outlined herein. Nevertheless, a surface water monitoring program is proposed to monitor the effectiveness of the proposed protection mechanisms and detection of any potential malfunction of the stormwater and leachate management systems (see Section 8.4.3).

Groundwater

Altered hydrology

The Proposal has the potential to intercept groundwater and result in impacts to the hydrology of the local or regional groundwater system. The Hydrogeological Assessment (Trace Environmental, 2016) (Appendix F) investigated the potential impacts to groundwater as a result of the Proposal and the findings are summarised below.

The proposed landfill excavation levels are described in Section 5.1.3 and shown in Figure 5-7. The floor level originally proposed for Stages 1 to 3 (in the 1999 EIS) has been redesigned (based on the observed groundwater head fluctuations between 2001 and 2016) to minimise impacts on groundwater hydrology.

In accordance with the EPA NSW (2016) and EPA Victoria (2015) guidelines, PMHC has adopted industry best practice for landfill design, such that the landfill floor will be

elevated 2 metres above the *average* long term groundwater level. Hence under average groundwater conditions the Proposal will have no impact on the local or regional groundwater system or the identified sensitive receiving environments.

In a large proportion of the Proposal Area, the proposed floor level is also above the *maximum* groundwater level. The most significant exceptions to this are in the southwest corner of Stage 1 and 2, the southern part of Stage 1, where excavation would intercept groundwater should maximum groundwater levels occur (see Figure 5-8). Under these circumstances, groundwater inflow into the base of the excavated area may occur at a low rate of 0.015 L/s. The resulting drawdown is predicted to reach a maximum level of 0.1 metre, and extend to a maximum distance of approximately one kilometre from the Proposal Site.

While groundwater inflows are expected to be very low (0.44ML/yr during Stage 1, 0.53ML/yr during Stage 2 and negligible during Stage 3), the predicted groundwater interception will need to be licenced, and volumes purchased on the market, in accordance with the Water Sharing Plan.

The identified groundwater users are more than one kilometre from the Proposal Site and no groundwater impact is predicted to occur at any of the identified bores (Trace Environmental, 2016). Potential impacts of drawdown on GDEs is discussed in the flora and fauna chapter (Section 8.2).

Following the installation of a drainage trench along the western boundary of Stage 1 and 2, and southern boundary of Stage 2, no inflow is expected to occur into the landfill during the operational period. The drainage trench (see Figure 5-9) will divert groundwater from recharge areas to the south and east of Stages 1 and 2, and allow it to discharge via natural flow to the south.

Post closure of the landfill, the cells will be capped and rehabilitated, and the groundwater level is expected to remain as per pre-development levels (i.e. an average of two meters below the cell floor). The drainage trench will remain post landfill closure and will continue to divert high level groundwater around the site. Therefore, the total groundwater inflow following capping and closure of the landfill is predicted to be the same as during operation (i.e. 0.03 to 0.3 ML/year for each of Stages 1 and 2 and negligible for Stage 3).

Given the ephemeral characteristics of Rawdon Creek and other unnamed tributaries, it is likely that creeks are discharging to groundwater. It is therefore predicted that there will be no change in surface water quality or flows as a result of the groundwater diversion, and predicted drawdown related to this Proposal (Trace Environmental, 2016).

Groundwater quality could also be impacted during construction or operation of the Proposal due to the spillage of hazardous materials and substances (e.g. oil and petrol) in the waste vehicles accessing the landfill. The potential for such an impact is considered low.

Ground water quality

As discussed in Section 8.4.1, based on the chemistry of leachate and baseline groundwater data, there is presently no mixing of leachate from the Stage E landfill with groundwater at the Proposal Site (Trace Environmental, 2016). Based on this finding, and considering the leachate management system for the new landfill is being improved above that currently in use for Stage E (in line with the requirements of the 2016 Landfill Guidelines), it is considered unlikely that the Proposal will impact on groundwater quality. Nevertheless, a groundwater monitoring program is proposed to monitor the effectiveness of the proposed protection mechanisms and detection of any potential malfunction of the stormwater and leachate management systems (see Section 8.4.3).

8.4.3 Mitigation measures

The Proposal includes a number of surface and groundwater mitigation measures as core components of the design, such as separation of clean and dirty water flows, installation and management of sediment basins and leachate management. Water quality impacts would be managed through the implementation of the Proposal in accordance with the Proposal Description, including the stormwater management strategy and leachate management design (Section 5).

The aim of the design is to minimise erosion and sedimentation, minimise leachate generated on site and prevent contamination of surface and groundwater. This section focuses on the surface and groundwater monitoring program that will be used to detect any potential breakdown of the proposed stormwater and leachate management measures, and does not repeat these core design elements as mitigation measures. Soil and leachate mitigation measures are outlined in Sections 8.3 and 8.5 respectively.

The surface and groundwater monitoring requirements for the Proposal are outlined in detail in the Concept Design Report (Appendix B) and the Hydrogeological Assessment (Appendix F). A brief summary is provided below.

Surface water monitoring

PMHC currently undertakes quarterly surface water monitoring in the main sediment and stormwater basins to detect cross contamination of stormwater with landfill leachate. The existing monitoring program will continue for the Proposal, as each stage is activated and stormwater basins are constructed. Parameters tested are generally in accordance with the Guidelines. The monitoring would typically include total suspended solids (or related measures such as turbidity) and indicators of leachate contamination (e.g. ammonia, total organic carbon and conductivity). The surface water quality monitoring parameters, and the water quality monitoring locations, are outlined in the Concept Design Report (Appendix B) and the Hydrogeological Assessment Report (Appendix F).

If surface water pollution is detected, PMHC would take immediate action to contain any known breach as far as practicable. A report would be prepared and submitted to the EPA detailing the nature and source of contamination, any actions taken and future actions that would be carried out to prevent a recurrence.

Groundwater monitoring

Nine groundwater monitoring bores are currently located within Cairncross WMF and are monitored on a quarterly basis to detect changes to groundwater levels and quality. The groundwater monitoring bore locations and the current minimum groundwater parameters are identified in the Concept Design Report (Appendix B).

The Hydrogeological Assessment (Trace Environmental, 2016) recommended that the current groundwater monitoring program is slightly altered (in terms of the frequency and parameters analysed) to ensure consistency with the Guidelines. The report recommended the installation of an additional four groundwater bores at the south-western and south-eastern boundary of Stages 2 and 3, respectively. A monitoring point in the gravel drainage trench was also recommended, prior to commencement of Stage 1. The additional bores would be installed prior to commencement of construction and would be incorporated into the regular monitoring network.

The groundwater monitoring program is described in detail in the Concept Design Report and in Table 8 of the Hydrogeological Assessment, including the monitoring locations, parameters and frequencies.

A groundwater remediation plan will be developed if groundwater monitoring confirms contamination has occurred. The plan will detail the process to return the groundwater to its original quality down gradient from the site and will describe the process to protect the groundwater resource from future contamination. The groundwater

remediation plan would be prepared and implemented as soon as possible after detection of the breach.

Reporting and remediation

Results from the surface and groundwater monitoring programs would be reviewed as they are collected to detect any changes which would indicate a malfunction of the environmental management measures implemented on the Proposal Site.

Annual Returns summarising the findings of the surface and groundwater monitoring programs would be submitted to the EPA in accordance with the requirements of the EPL. Incident reports are to be prepared in response to any breaches of the EPL licence limits and in response to any other incidents experienced on site.

In addition, a groundwater assessment report would be prepared at least once every five years, or should the groundwater monitoring program detect a possible failure of the leachate containment system. The 2008 OEMP would be updated to include measures for remediation of any water pollution detected through the water monitoring program.

Summary

Table 8-14 identifies the safeguards and management measures that will be implemented to address potential water quality impacts associated with the Proposal.

Table 8-14 Water mitigation measures

ID	Mitigation measures	Timing
W-01	Measures to minimise the demand for water for dust generation would be implemented (e.g. minimising vehicle movements on unsealed roads and minimising excavation/earth moving during windy periods, where possible).	Construction / operation
W-02	A surface and groundwater monitoring program would be developed in accordance with requirements outlined in the Concept Design Report (Appendix B), the Hydrogeological Assessment (Appendix F) and the Guidelines.	Pre-construction / operation
W-03	A groundwater assessment report would be prepared at least once every five years, or should the groundwater monitoring program detect a possible failure of the leachate containment system.	Pre-construction / construction / operation

8.5 Leachate

The SEARs require that the EIS for the Proposal address potential impacts related to leachate. Table 8-15 provides a summary of the relevant SEARs and where these have been addressed in this EIS.

Table 8-15 SEARs relevant to leachate

SEAR	Where addressed in EIS?
Soil, Water and Leachate	
- the proposed leachate management system including the capacity of the system to treat and dispose of leachate.	Section 5.6 Section 8.5

8.5.1 Existing environment

As discussed in Section 5.6, the Stage E landfill includes a leachate barrier system and a leachate collection system which conveys leachate to a collection tank. The leachate is then pumped to infiltration/recirculation basins. When leachate volumes exceed infiltration capacities, leachate is transported off site to a sewer treatment plant (STP).

Stage E, Stage 1 and Stage 2 of the Proposal are within a catchment that drains south to land owned by State Forests NSW (Forestry Corp). Stage 3 is located in a catchment which drains to the south-east through Rawdon Creek Nature Reserve. The natural catchment layout was considered when designing the proposed leachate management system (described in Section 5.6). Leachate from Stages E, 1 and 2 will ultimately drain to the one collection point before being pumped to a new STP (soon to be built on an adjacent site). Leachate from Stage 3 will drain to a separate collection tank and then be pumped to the STP.

PMHC currently undertakes routine leachate composition monitoring for the Stage E landfill on a quarterly basis by sampling and testing leachate from the main collection tank within Stage E and infiltration basins. The sampling locations are identified as CL1, CL2 and CL3 and are shown on Figure 8-11[15]. Parameters tested are generally in accordance with the Guidelines. The quality of leachate generated by the Proposal is expected to be similar to that generated by the Stage E landfill.

Leachate quality monitoring data from 2010/2011 was reported in the *Water Quality Monitoring Summary Report for Dunbogan, Port Macquarie, Wauchope and Cairncross landfills for the 2010 and 2011 License Period* (Connor and Smith, 2012). The report noted:

- Reduced stable levels of ammonia and fluoride (compared to historically elevated levels)
- A significant spike in nitrate in June 2010 (which decreased to below the limit of detection at the last sampling event assessed in the report)
- A spike in fluoride (which returned to expected levels at the end of monitoring period)
- A decrease in alkalinity concentrations in June 2010 (which returned to expected levels at later sampling events)
- An upward trend in phenol levels in June and September 2010 (which returned to expected levels at subsequent sampling events).

Arcadis have reviewed leachate quality monitoring data provided by PMHC, including more recently collected data than that reported in the 2012 Conner and Smith report. Leachate quality data from sampling location CL1 has been typically collected on a quarterly basis between March 2002 and March 2017, encompassing 61 sampling events. Leachate quality data from sampling locations CL2 and CL3 has been collected on nine and eight separate occasions respectively, occurring between April 2015 and August 2016. A summary of leachate quality results is provided in *Table 8-16* below.

Ammonia is considered herein as the primary tracer compound and the results below have been analysed in relation to groundwater quality data (see Section 8.4).

[15] Note: CL1 is the EPL reference point. CL1 has recently been removed and relocated to a new leachate collection point. This point is labelled CL4. CL2 & 3 are additional infiltration dams and have historically been monitored unnecessarily. In the future only the EPL point will be monitored.

Table 8-16 Summary of leachate quality results from sample locations CL1, CL2 and CL3

Parameter	Units	CL1 Mar 2002 – Mar 2017		CL2 Apr 2015 – Aug 2016		CL3 Apr 2015 – Aug 2016	
		Min	Max	Min	Max	Min	Max
pH	-	5.4	8.12	4.9	8.6	7.5	8.0
EC	µS/cm	3,620	26,100	2,800	17,200	3,460	12,500
Ammonia	mg/L	21.6	1,640	82	1,190	59.2	685
Nitrate	mg/L	<0.01	25	<0.01	21	<0.01	10.6
Phenols	mg/L	<0.1	13.6	<0.05	<0.50	<0.05	<0.50
Iron	mg/L	<0.1	837	1.43	15.70	1.45	17.40
Manganese	mg/L	<0.1	34	0.06	0.36	0.05	0.30

8.5.2 Assessment of impacts

Leachate quality and volumes

Leachate is liquid waste generated through decomposition of waste within a landfill. The volumes and quality of leachate are influenced by the amount of rainfall or runoff which infiltrate into the waste mass. If not managed appropriately, leachate could migrate outside of the lined landfill cell and result in soil, surface and groundwater contamination.

The quality of leachate generated by the Proposal is expected to be similar to that generated by the Stage E landfill, however may vary somewhat due to the expected decrease in organic waste to be received in future years (as a result of increased coverage of the compulsory domestic collection service for food and garden organics).

The volume of leachate predicted to be generated by the Proposal was estimated by Pacific Environment using the Hydrological Evaluation of Landfill Performance (HELP) model. The detailed results are presented in the report *Cairncross Landfill Leachate Generation Modelling* (Leachate Assessment) (Pacific Environment, 2016) (Appendix S). The following information is drawn from the Leachate Assessment.

Leachate generation rates were assessed under five scenarios based on landfill staging across the current and future staging areas and at completion of filling, expected in approximately 2056. Scenario one covers the staged development of the Stage E landfill. Scenarios two, three and four cover the staged development of the proposed landfill (Stages 1, 2, 3) and Scenario five covers post closure of the landfill.

All scenarios considered leachate generation rates based on an average rainfall year, 90th percentile rainfall year and an average wet period (1988-1990) within years 1971 to 2015. The scenarios considered the highest rate of leachate generation for each cell (i.e. when waste covers the full cell area).

The results demonstrate that the maximum monthly leachate generation will occur during Stage 3 of landfilling operations (i.e. Stage E, Stage 1 and Stage 2 closed and under 100 per cent final cap, with Stage 3 active with 75 per cent under final cap, 22.5 per cent under interim cover and 2.5 per cent under daily cover). Under this worst

case scenario, an average of approximately 1,972 m^3/month of leachate would be generated during average rainfall year and approximately 2,280 m^3/month would be generated during a high rainfall year.

Leachate flow rates were generated based on the worst case leachate generation from a highest rainfall month as described in Table 8-17. Stages E, 1 and 2 are grouped as they are within the one catchment and will drain to a central location. Stage 3 is presented independently as it is in a separate catchment and will drain to a separate location.

Table 8-17 Leachate flow rates under worst case (maximum generation) scenario (Stage 3)

Catchment	Leachate generation (m^3/ha/month)	Total ha	Flow rate (m^3/mth)	Flow rate (m^3/day)	Flow rate (m^3/hr)	Flow rate (m^3/s)	Pipe discharge velocity (m/s)		
							200mm	150mm	2x100mm
Stage E, 1 & 2 (closed and capped)	265	28.5	1,183.5	39.45	1.64	0.00045	0.014	0.025	0.028
Stage 3 (operational)		16.9	1,097.4	36.58	1.52	0.00042	0.013	0.023	0.026

Summary of potential impacts

A core element of the Proposal is the leachate management strategy, which is described in detail in Section 5.6. This strategy includes a leachate barrier system, leachate collection system and leachate storage and disposal system. These elements have been designed largely in compliance with the Guidelines and have taken into account the maximum leachate volumes and velocities identified in the Leachate Assessment.

Importantly, the leachate generated at the landfill will be collected in leachate tanks (sized for two days storage at the maximum predicted leachate flow rate) and then pumped to the new STP for treatment and disposal. The STP will be managed by PMHCs Water and Sewer section and is being specifically designed to accommodate the leachate characteristics and estimated flow rates. A trade waste agreement (TWA) will be established to cover the transfer of leachate from the Proposal to the STP. The STP will provide sufficient treatment to allow disposal of effluent (including treated leachate) to the environment in accordance with the POEO Act.

The stormwater management strategy (Section 5.3) also forms an inherent part of the Proposal and includes measures to prevent surface water being contaminated by leachate and prevent surface water infiltration into the landfill. Landfill process and cover requirements (Section 5.9.4) include daily, final and intermediate cover to help minimise rainfall infiltration into the waste mass and therefore minimise the generation of leachate.

Potential impacts to soil, surface and groundwater are considered unlikely provided the Proposal is implemented in accordance with the design outlined herein. Nevertheless, there remains the potential for a malfunction of the leachate management system, and mitigation measures have been developed to monitor for such an occurrence and address potential impacts.

8.5.3 Mitigation measures

Table 8-18 identifies safeguards and management measures that will be implemented to address potential leachate impacts associated with the Proposal.

Leachate related impacts (including the potential for soil, surface and groundwater contamination) would be managed through the implementation of the Proposal in accordance with the Proposal Description, including the stormwater management strategy and leachate management strategy (Section 5). The aim of these strategies is to minimise leachate generated on site, prevent contamination of surface and groundwater and avoid the migration of leachate outside of the landfill cell.

A water quality monitoring program would be implemented for the Proposal to monitor the effectiveness of these measures in achieving this objective (i.e. to detect any failures in the leachate management system). The Hydrogeological Assessment (Appendix F) includes monitoring requirements for leachate and this would be implemented for the Proposal. Water quality mitigation measures, including the proposed monitoring program, are outlined in Section 8.4

Table 8-18 Leachate mitigation measures

ID	Mitigation measures	Timing
L-01	Consideration of, and recommendations regarding, a leachate extraction and level-control system (including a collection sump and leachate risers) would be developed to facilitate extraction of leachate from each cell.	Pre-construction
L-02	A leachate monitoring program would be developed in accordance with the requirements outlined in the Concept Design Report (Appendix B) and Leachate Assessment (Appendix S)	Pre-construction / operation

8.6 Air quality and odour

The SEARs require that the EIS for the Proposal address potential impacts to air quality and odour. Table 8-19 provides a summary of the air-related SEARs and where these have been addressed in this EIS.

Table 8-19 SEARs relevant to air quality and odour

SEAR	Where addressed in EIS?
Air Quality and Odour	
- a quantitative assessment of the potential air quality and odour impacts of the development on surrounding receivers, including impacts from construction, operation and transport;	Sections 8.6.1 and 8.6.2
- details of the proposed mitigation, management and monitoring measures.	Section 8.6.3

An air quality assessment was undertaken by Wilkinson Murray to determine potential dust and odour impacts on nearby sensitive receivers from the Proposal (*Cairncross Landfill Air Quality Impact Assessment*) (Wilkinson Murray, 2017a) (Appendix K). The detailed assessment is provided in Appendix K. This section provides a summary of the findings and mitigation measures of the assessment in relation to potential impacts associated with the Proposal on air quality and odour.

8.6.1 Existing environment

Sensitive receivers

The land use surrounding the Proposal Site is predominantly rural. The nearest sensitive receivers to the Proposal Site, and potentially most affected, are identified in Table 8-20, including their approximate distance from the Proposal Site.

Table 8-20 Sensitive receivers closest to the Proposal Site

Receptor	Address	Distance to site boundary (m)
R1	1101 Pembrooke Road, Pembrooke	850
R2	21 Reids Road, Pembrooke	1,230
R3	23 Reids Road, Pembrooke	1,230
R4	8493 Pacific Highway, Telegraph Point	1,400

Long-term meteorological data

Long term meteorological data from the BOM weather station at Port Macquarie Airport, located approximately 12 kilometres south-east of the Proposal Site, were analysed to characterise the local climate in the proximity of the Proposal including wind speed, wind direction, temperature, humidity and rainfall. Figure 8-14 presents the annual and seasonal windrose plots for Port Macquarie Airport for the period 2012 to 2016.

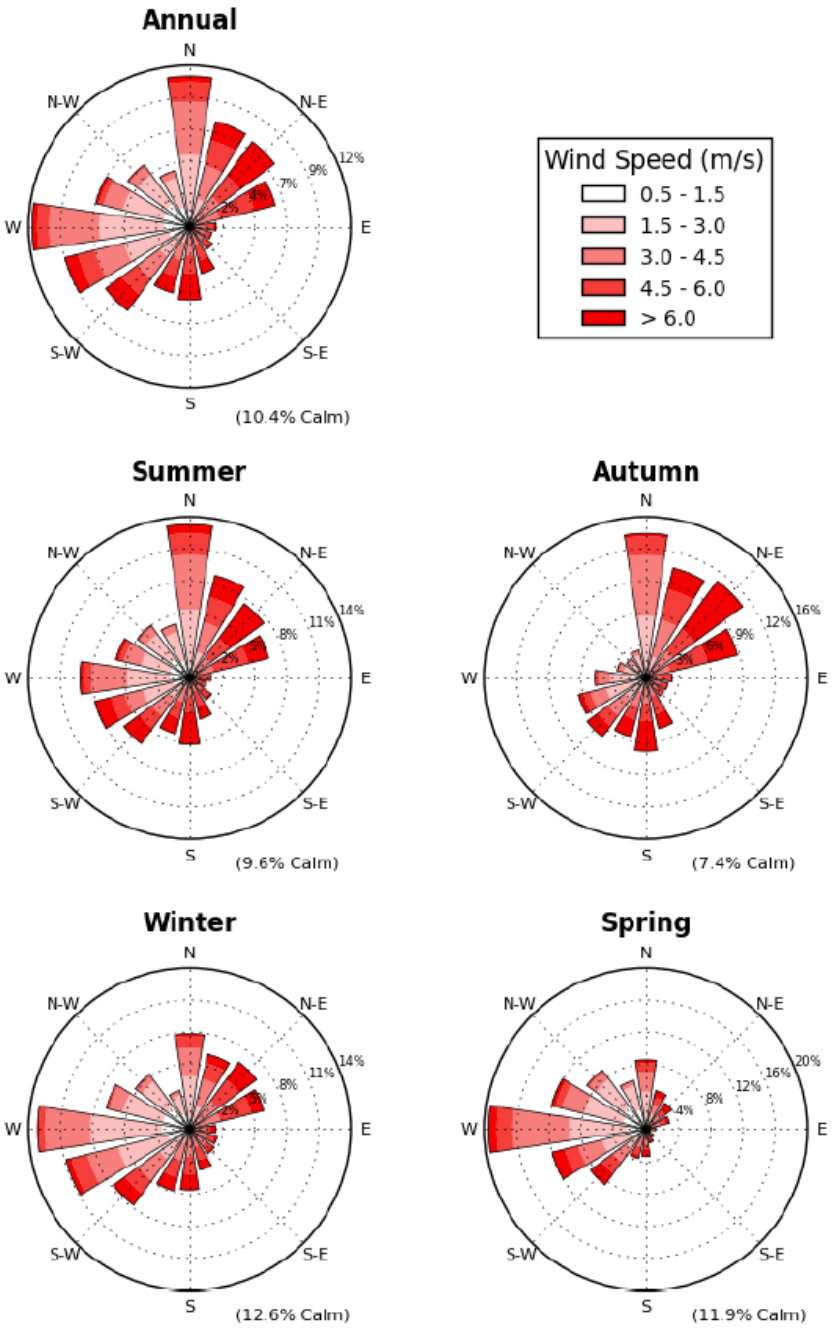


Figure 8-14 Port Macquarie Airport windroses, 2012 to 2016 Source; WM 2017

The data show consistent patterns of wind speed and wind direction, with northerly to north-easterly winds being prevalent in summer and autumn, and westerly winds being prevalent in winter and spring.

Temperature data indicate January is the hottest month of the year, with a mean daily maximum temperature of 27.7°C. July is the coolest month with a mean daily minimum temperature of 6.5°C. Figure 8-15 shows the mean annual temperature at Port Macquarie Airport for the period 1995 to 2017.

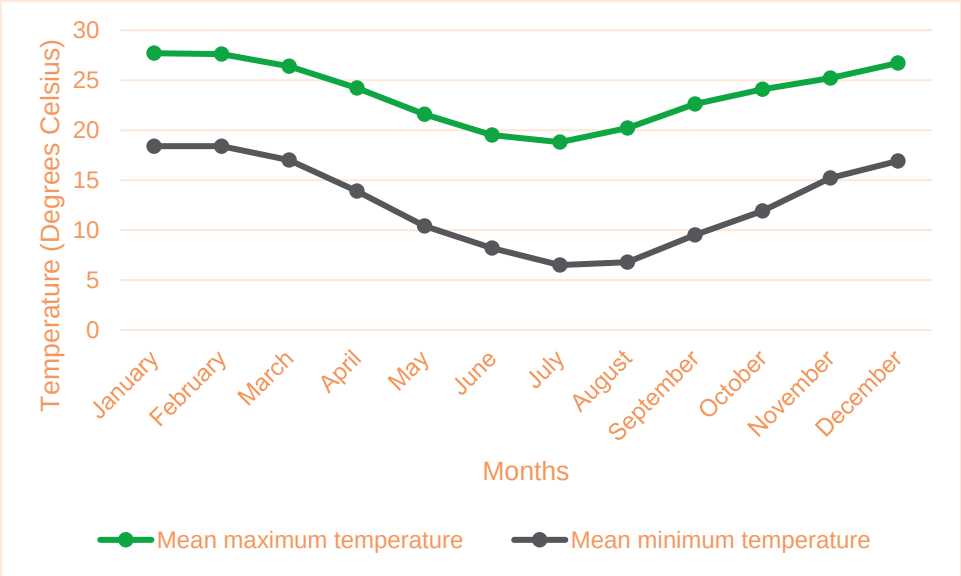


Figure 8-15 Mean annual temperatures at Port Macquarie Airport, 1995 to 2017 (BoM 2017)

The wettest month is March with an average rainfall of 176 millimetres falling over 11 days. There are on average 100 rain days per year, delivering 1,417 millimetres of rain. The driest month is in September with an average rainfall of 61.8 mm falling over 5.7 days. Figure 8-16 shows the mean annual rainfall at Port Macquarie Airport for the period 1995 to 2017.

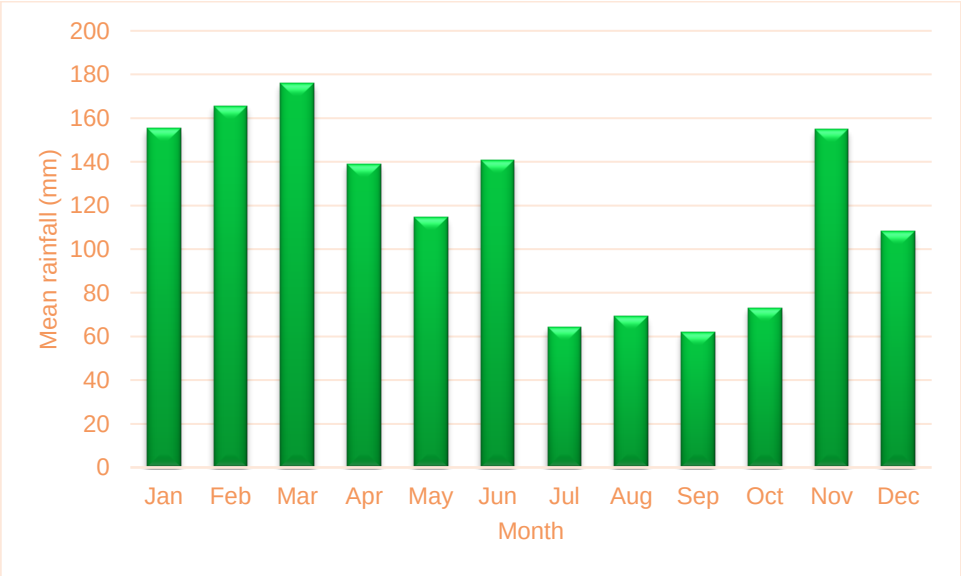


Figure 8-16 Mean annual rainfall at Port Macquarie Airport, 1995 - 2017 (BoM 2017)

Local ambient air quality

Odour

The most significant potential odour sources in the vicinity of the sensitive receptors are the existing activities at the Cairncross WMF. Existing odour levels at sensitive receptors are, however, understood to be negligible, as during site visit no sources of offensive or nuisance odour were detected at sensitive receptors and Cairncross WMF has no history of odour complaints.

Dust and particulate matter

No ambient air quality monitoring data was available for the area surrounding the Proposal Site. Wilkinson Murray were able to estimate existing ambient air quality using data obtained from the Wallsend monitoring station as it was considered to be most representative of the area surrounding the Proposal[16].

A summary of the PM_{10} and $PM2_{.5}$ monitoring results from the most recent complete year of data (2016) collected at the Wallsend monitoring site is presented in Table 8-21.

Table 8-21 Particulate matter monitoring results (2016) – Wallsend

Pollutant	Annual Average ($\mu g/m^3$)	24 Hour Average ($\mu g/m^3$)	
		Maximum	90th Percentile
PM_{10}	16.6	65.5 (35.2)[1]	25.7
$PM_{2.5}$	7.8	50.7 (22.6)[1]	12.6

[1] The values in brackets are adopted for assessment purposes as they represent the maximum 24-hour average PM_{10} and $PM_{2.5}$ concentrations measured at Wallsend (these values exclude impacts from a bushfire event in November 2016).

Table 8-22 summarises the background air quality adopted for assessment purposes.

Table 8-22 Background air quality adopted for the assessment

Pollutant	Averaging Period	Adopted Background Concentration/Level
PM_{10}	24-hour	35.2 $\mu g/m^3$
	Annual	16.6 $\mu g/m^3$
$PM_{2.5}$	24-hour	22.6 $\mu g/m^3$
	Annual	7.8 $\mu g/m^3$
TSP	Annual	41.5 $\mu g/m^3$
Deposited Dust	Annual	1.84 g/m^2/month

8.6.2 **Assessment of impacts**

Assessment Criteria

Air quality criteria are benchmarks set to protect the general health and amenity of the community in relation to air quality. The sections below identify the applicable air quality criteria for the potential air emissions that would be generated by the Proposal.

Odour

Prediction of the likely odour impacts that may arise from a proposed development is accomplished by using air dispersion modelling which can calculate the level of dilution of odours emitted from the source at the point that it reaches surrounding receptors. This approach allows the air dispersion model to produce results in terms

[16] The Wallsend monitoring station is located approximately 200 km south of the Proposal Site, and is in an area that is significantly more developed than the area surrounding the Proposal, and is also in a region with a number of large open-cut coal mines. Therefore, the use of data from the Wallsend monitoring station to characterise the existing ambient air quality in the area surrounding the Proposal is considered to be conservative.

of odour units, which represent the number of times that the odour would need to be diluted to reach a level that is just detectable to the human nose. Odour less than one odour unit (1 OU), would not be detectable to most people.

The NSW criteria for acceptable levels of odour range from 2 to 7 OU, with the more stringent 2 OU criteria applicable to densely populated urban areas and the 7 OU criteria applicable to sparsely populated rural areas. The odour criterion 7 OU is applied in this assessment for residential receptors in a rural environment.

Dust and particulate matter

Table 8-23 summarises the air quality criteria for dust and particulate matter that are relevant to the Proposal. The air quality criteria relate to the total concentrations of dust and particulate matter in the air and not just the pollutants from the Proposal. As such, background levels require consideration when using this criteria to assess impacts.

Table 8-23 NSW EPA air quality assessment criteria

Pollutant	Averaging period	Impact	Criteria
Total suspended particulates (TSP)	Annual	Total	90 µg/m³
Particulate matter ≤10 µm (PM_{10})	Annual	Total	25 µg/m³
	24-hour	Total	50 µg/m³
Particulate matter ≤2.5 µm ($PM_{2.5}$)	Annual	Total	8 µg/m³
	24-hour	Total	25 µg/m³
Deposited dust (DD)	Annual	Total	4 g/m²/month
	Annual	Incremental	2 g/m²/month

Air quality impacts

As construction and operational activities will occur concurrently (due to the progressive nature of cell excavation and filling) the air quality impacts have been modelled and assessed using a single operational worst-case scenario that incorporates both construction and operational impacts.

As no meteorological observation data is available for the Proposal Site, site-specific meteorological data was generated through the use of The Air Pollution Model (TAPM) (developed and distributed by the Commonwealth Scientific and Industrial Research Organisation). TAPM is used to predict local scale conditions for air pollution dispersion such as: wind speed, wind direction, temperature, humidity, cloud cover, solar radiation and rainfall. The site specific data were then input into CALPUFF - a non-steady state puff dispersion model that predicted dispersion of odour and dust pollution. Results from the CALPUFF modelling are presented below.

Odour

The predicted operational odour impacts are presented in Table 8-24 and Figure 8-17. These results indicate that the predicted 99th percentile odour concentrations associated with the Proposal comply with the impact assessment criteria at all sensitive receptors.

Table 8-24 Predicted 99th percentile peak odour concentrations

Receptor	Predicted peak odour concentration (OU/m^3)	Impact assessment criterion (OU/m^3)
R1	0.75	7.0
R2	0.27	7.0
R3	0.08	7.0
R4	0.29	7.0

Complies: Yes ■ No ■

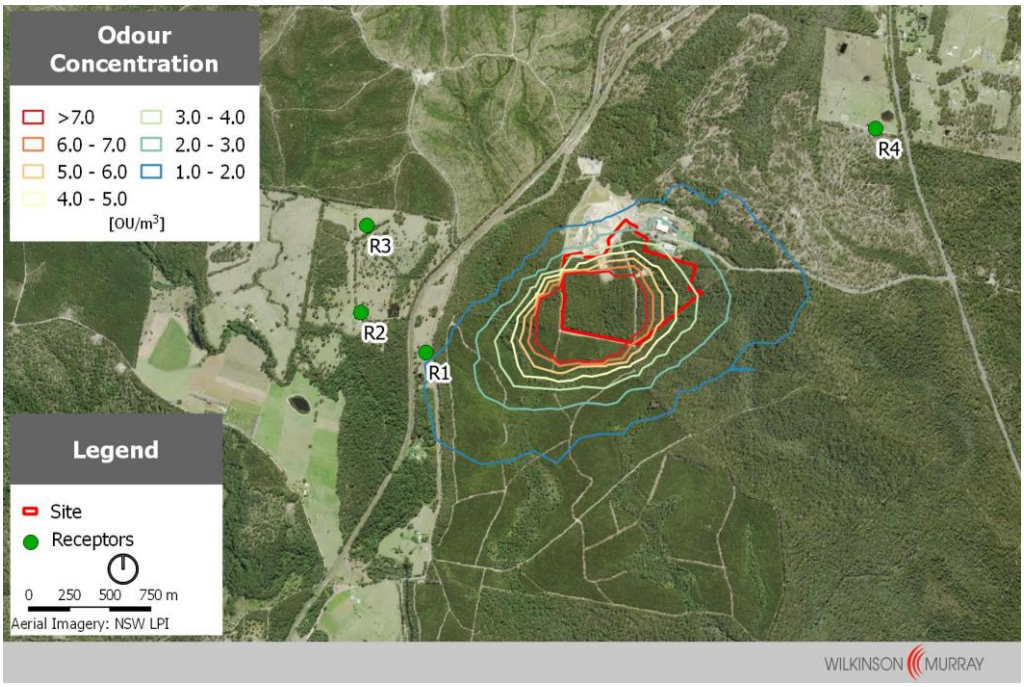


Figure 8-17 Predicted 99th percentile peak odour concentrations (Wilkinson Murray, 2017)

To ensure odour concentrations are controlled and the potential for off-site impacts are reduced, appropriate mitigation measures are described in Section 8.6.3.

Dust and particulate matter emissions

The most significant dust generating activities on the Proposal Site would be waste vehicles driving on unsealed roads to deposit waste at the tipping face, and on-site plant and equipment (e.g. excavators) being used to excavate landfill cells and deposit daily, intermediate and final cover onto the waste. As such, the most significant dust generating period of the Proposal would be during Stage 3, where the greatest volume of waste is being delivered to the site, and when the highest number of associated vehicle movements would occur. The estimated TSP emissions from these activities are presented in Table 8-25.

Table 8-25 Estimate worst case annual TSP emissions

Activity	TSP Emissions (kg/year)
Compactor	24,492
Excavators - loading tipper	48
Tipper - dumping	48
Haul roads - tipper	7,748

Activity	TSP Emissions (kg/year)
Haul roads - waste	120,780
Wind erosion - stockpiles	701
Wind erosion - exposed area	1,752
Total	**155,568**

TSP and particulate matter dispersion modelling results at sensitive receptors are presented in Table 8-26. A contour plot of the incremental 24-hour average PM_{10} concentrations is presented in Figure 8-18. These results indicate that the predicted incremental and total operational dust impacts associated with the Proposal comply with the impact assessment criteria at all sensitive receptors.

Table 8-26 Predicted TSP and particulate matter impacts at sensitive receptors

Receptor	TSP		PM_{10}				$PM_{2.5}$			
	Annual		24-hour		Annual		24-hour		Annual	
	Increment	Total	Increment	Total	Increment	Total	Increment	Total	Increment	Total
Goal	**90 µg/m³**		**50 µg/m³**		**25 µg/m³**		**25 µg/m³**		**8 µg/m³**	
R1	2.6	44.1	13.8	49	1.8	18.4	2.0	24.6	0.2	7.8
R2	1.7	43.2	14.8	50	1.2	17.8	1.9	24.5	0.2	7.8
R3	1.2	42.7	10.6	45.8	0.9	17.5	1.5	24.1	0.1	7.7
R4	0.6	42.1	5.0	40.2	0.4	17	0.7	23.3	0.1	7.7

Complies: Yes ■ No ■

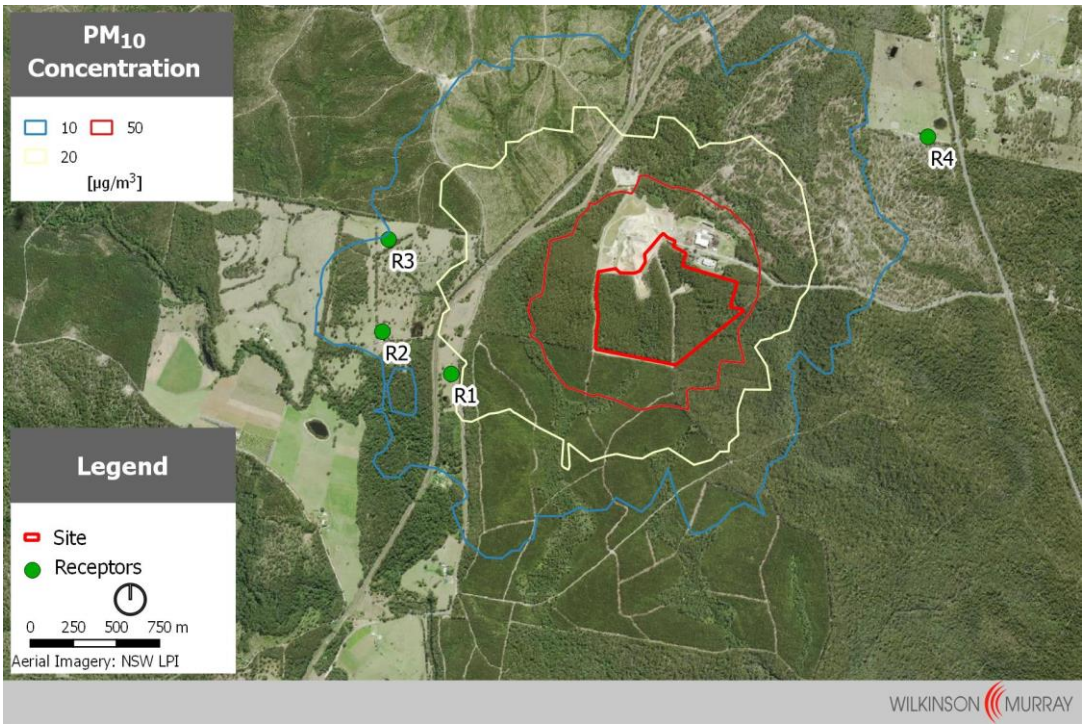


Figure 8-18 Predicted incremental 24-hour average PM_{10} concentration (Wilkinson Murray, 2017)

The predicted deposited dust levels at sensitive receptors are presented in Table 8-27. These results indicate that the predicted deposited dust impact associated with the Proposal comply with the impact assessment criteria at all sensitive receptors.

Table 8-27 Predicted deposited dust impacts at sensitive receptors

Receptor	Deposited Dust	
	Annual	
	Increment	Total
Goal	**2 g/m^2/month**	**4 g/m^2/month**
R1	0.11	1.95
R2	0.04	1.88
R3	0.03	1.87
R4	0.02	1.86

Complies: Yes No

To ensure dust generation is controlled and the potential for off-site impacts are reduced, appropriate mitigation measures are described in Section 8.6.3.

8.6.3 Mitigation measures

The air quality impact assessment has demonstrated the Proposal is expected to comply with all relevant air quality criterion. Notwithstanding this, mitigation measures are identified in Table 8-28 to further manage odour and dust emissions from the Proposal Site.

Table 8-28 Air quality and odour mitigation measures

ID	Mitigation measures	Timing
A-01	Procedures and training for staff would be developed to report the presence of strong odours around the perimeter of the Proposal Site	Operation
A-02	The active tipping face would be kept as small as practicable.	Pre-construction / construction / operation
A-03	Vehicles will be maintained and serviced according to the manufacturer's specifications and engines will be switched off when not in use	Construction / operation
A-04	All trucks entering and leaving the premises carrying loads must be covered at all times, except during loading and unloading	Construction / operation
A-05	Vehicles would be limited to a speed limit of 20 km/h	Construction / operation
A-06	Appropriate dust management practices would be maintained, including use of washing down as required and reducing drop heights from loading and handling equipment, where possible.	Construction / operation
A-07	The complaints management procedures currently in place at the Cairncross WMF would be updated for the Proposal for the future landfill stages, including maintenance of the existing Complaints Register.	Construction / operation

8.7 Noise and vibration

The SEARs require that the EIS for the Proposal address potential impacts to noise and vibration. Table 8-29 provides a summary of the air-related SEARs and where these have been addressed in this EIS.

Table 8-29 SEARs relevant to noise and vibration

SEAR	Where addressed in EIS?
Noise and vibration	
- quantitative assessment of potential construction, operational and transport noise and vibration impacts, including potential impacts on nearby sensitive receivers;	Section 8.7.2
- details of the proposed noise management and monitoring measures.	Section 8.7.3

A noise and vibration assessment was undertaken by Wilkinson Murray to determine potential noise and vibration impacts on nearby sensitive receivers from the Proposal (*Cairncross Landfill Noise and Vibration Impact Assessment*) (Wilkinson Murray, 2017b) (Appendix I). Due to the nearest receivers being located more than 700 metres from the Proposal Site, vibration impacts were considered unlikely and were not investigated further in the assessment. This section provides a summary of the findings of the assessment in relation to potential impacts associated with the Proposal on noise.

8.7.1 Existing environment

Sensitive receivers

The land use surrounding the Proposal Site is predominantly rural. The nearest sensitive receivers to the Proposal Site are identified on Figure 8-19 and in Table 8-30, including their approximate distance from the Proposal Site.

Table 8-30 Sensitive receivers

Receiver	Address	Distance to site boundary (m)
R1	1101 Pembrooke Road, Pembrooke	850
R2	21 Reids Road, Pembrooke	1,230
R3	23 Reids Road, Pembrooke	1,230
R4	8493 Pacific Highway, Telegraph Point	1,400

Existing ambient noise levels

Noise monitoring was conducted between 28 November and 12 December 2014 at 1101 Pembrooke Road (shown in Figure 8-19 as L1) to establish existing noise levels at the most affected receivers.

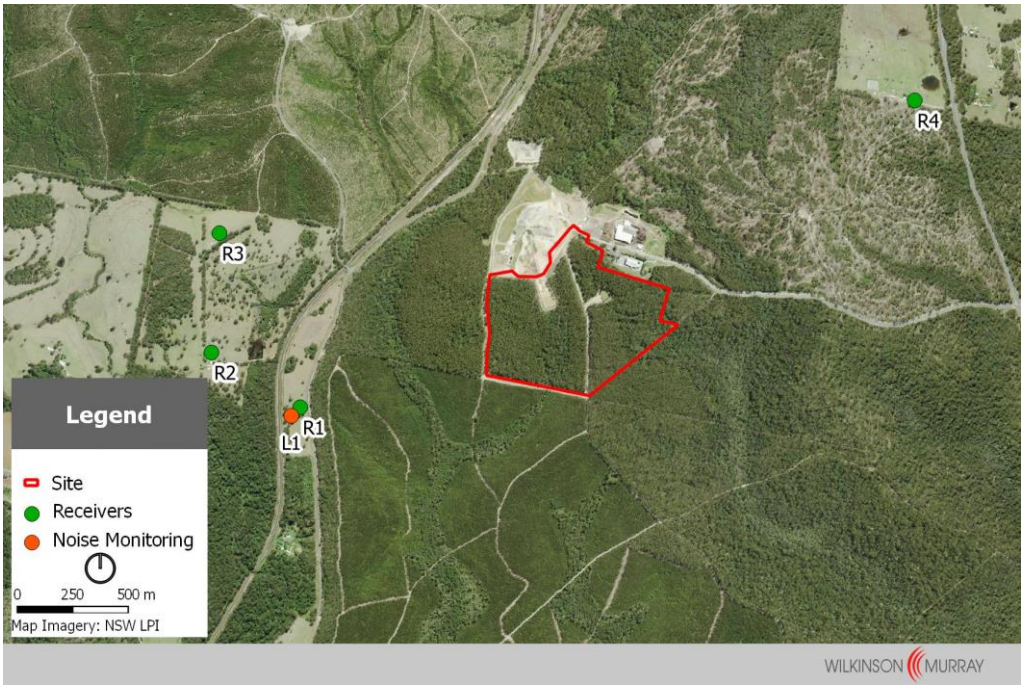


Figure 8-19 Noise monitoring location

The Rating Background Levels (RBLs) were determined using the background noise levels (L_{A90}) recorded. The existing ambient noise levels are shown in Table 8-31.

Table 8-31 Existing ambient noise levels

Monitoring location	Time period[1]	Noise Levels (dBA)	
		RBL	L_{Aeq}
L1	Day	34	49
	Evening	34	54
	Night	34 (37)[2]	52

[1]Day = 7:00am – 6:00pm, Evening = 6:00pm – 10:00pm, Night = 10:00pm – 7:00am
[2]Night time RBL set to lowest of daytime and evening RBL in accordance with INP.

8.7.2 **Assessment of impacts**

Assessment criteria

Two guidelines were used to determine the appropriate noise impact assessment criteria for the Proposal including:

- *NSW Industrial Noise Policy* (INP) (EPA, 2000): provides the framework and process for deriving noise limit conditions for consents and licences issued by the EPA. The INP sets guideline noise targets in order to provide assessment benchmarks for noise emitted by commercial or industrial activities into the community. The INP attempts to provide a balance between development and protecting the noise amenity of the community. The INP is based upon extensive research into community reactions to noise and presents two criteria for protecting the community against noise. These are the intrusiveness and amenity criteria; and
- *NSW EPA Road Noise Policy* (RNP) (EPA, 2011): defines criteria to be used in assessing the impact of road traffic noise from new developments.

Noise criteria generally apply to both day time and night time periods. However, as the Proposal will only operate during the day time (7:00am to 6:00pm), night time criteria are not relevant and are not discussed below.

Operational noise criteria

The INP intrusiveness criterion, applied to residential receivers, requires that the LA_{eq} noise level from the source being assessed, when measured over 15 minutes, should not exceed the RBL by more than 5 dBA.

The INP amenity criterion sets a limit on the total noise level from all industrial noise sources affecting a receiver. The amenity criteria aims to protect amenity noise levels by setting targets that ensure the industrial noise contribution within an area does not exceed the amenity noise levels specified in the INP. Different amenity criteria apply for different types of receiver (e.g. residential, commercial, industrial) and different areas (e.g. urban, suburban, rural). In accordance with the INP, all residential receivers identified in this assessment are classified as rural residential receivers.

Where noise levels from existing industrial sources are already close to or above the acceptable amenity criterion, the INP requires that the acceptable amenity criterion for any further proposed industrial noise source is commensurately lowered, in the interest of preserving noise amenity. This provision is aimed at the prevention against cumulative noise increases over time, due to industrialisation.

The project-specific noise levels (PSNL) reflect the most stringent noise level requirement from the criteria, derived from both the intrusiveness and amenity criteria, to ensure that intrusive noise is limited and amenity is protected. The PSNLs applicable to the Proposal are shown in Table 8-32.

Table 8-32 Project-specific noise levels

Receiver	Time Period[1]	Criteria (dBA)		PSNL ($L_{Aeq, 15min}$)
		Intrusiveness ($L_{Aeq, 15min}$)	Amenity ($L_{Aeq, period}$)	
R1 – R4	Day	39	50	39

[1]Day = 7:00am – 6:00pm.

Road traffic noise criteria

The timeframes adopted for analysis in this assessment are the year of opening (2020) and the year of closing (2056). The 2056 assessment year represents a worst-case scenario as this is the final year of operation whereby the highest number of traffic movements will be generated to/from the Proposal site.

This assessment is focused on noise impacts from traffic generated by the Proposal along the section of the Pacific Highway anticipated to be bypassed prior to the operation of the Proposal. This road, referred to as the “local council road” would still function as an arterial road. The RNP assessment criteria for residential land uses near the local council road are shown in Table 8-33.

Table 8-33 RNP criteria for road traffic noise

Road	Category	Assessment Criteria - dBA
		Day(7am – 10pm)
Local Council Road	Arterial Road	$L_{Aeq, 15\ hour}$ 60 (external)

Noise impact assessment

Operational impacts

As construction and operational activities will occur concurrently (due to the progressive nature of cell excavation and filling) the noise impacts have been modelled and assessed using a single operational worst-case scenario that incorporates both construction and operational impacts. This approach is conservative as noise criteria for construction are generally more relaxed than those for operations. The 2056 assessment year represents a worst-case assessment year as this is the final year of operation whereby the highest number of mobile plant and traffic movements will occur on the site.

The most significant sources of operational noise associated with the Proposal are the various items of mobile plant used in the day-to-day operation of the landfill and the incoming waste trucks. The key mobile plant items associated with the daily operation of the landfill and their respective sound power levels (SWL) are provided in Table 8-34.

Table 8-34 Summary of noise source levels

Plant Item	Quantity (per worst case 15 min period)	SWL[1] per item (dBA)
Boggy tipper	1	105
Compactor	1	113
Excavator (20 tonne)	2	107
Water truck	1	105
Waste truck	6	103

[1]The source SWL are derived from previous measurements conducted by Wilkinson Murray at similar sites.

It is assumed that all items identified in Table 8-34 are operating simultaneously in order to assess the operational noise levels from the Proposal against the established criteria. As this is not indicative of typical operations, the activities on the Proposal site during actual operations, and accordingly the operational noise, will be significantly less than modelled in this assessment. As such the noise assessment for the Proposal is considered conservative.

Predicted operational noise levels at sensitive receivers

L_{Aeq}, 15min operational noise levels at sensitive receivers have been predicted for the worst case operational scenario (in the 2056 assessment year) and are presented in Table 8-35. The results indicate that the predicted operational noise levels at nearby receivers comply with the established criteria during the proposed hours of operation.

Table 8-35 Predicted $L_{Aeq, 15min}$ noise levels (2056)

Receiver	Predicted $L_{Aeq, 15min}$ Noise Level (dBA)		Criterion	Complies?
	Calm winds	2 m/s source to receiver wind	Day[1]	
R1	22	27	39	Yes
R2	<20[1]	22	39	Yes
R3	<20	23	39	Yes
R4	21	25	39	Yes

[1] Predicted noise levels below 20 dBA are not reported explicitly, as it is impractical to validate such low noise levels via measurements under real-world conditions

Cumulative noise impacts

The Proposal is considered unlikely to contribute to any cumulative noise impacts at nearby receivers as the predicted noise levels from the worst-case day-to-day site operations, which would include some construction activities, are 10 dBA below the established criterion at the most affected receiver under adverse meteorological conditions.

Road traffic noise assessment

Predicted road noise levels

Road noise levels have been calculated at the most affected receivers using the traffic volumes sourced from the traffic impact assessment (refer to Section 8.8) along the local council road in the years 2020 (year of opening) and 2056 (year of closing) under “No-Build” and “Build” scenarios. The predicted road noise levels are summarised in Table 8-36 and show that the road noise levels are predicted to exceed the RNP assessment criteria at the most potentially affected receivers to the north and south of the Proposal site in the year of opening and closing, respectively. In accordance with the RNP, any increases in road noise levels due to a traffic generating development should be limited to no more the 2 dB above the “No-Build” option. The increase in road noise levels due to the Proposal is less than 2dB and therefore no mitigation of traffic noise levels is warranted.

Table 8-36 Predicted road noise levels

Road Section	Time[1]	Predicted L_{Aeq} Noise Level (dBA)				Criteria (dBA)	Increase (dBA)	
		No-Build		Build				
		2020	2056	2020	2056		2020	2056
Local Council Road (North of Cairncross WMF)	Day	59.1	59.9	59.3	60.7	60	0.2	0.8
Local Council Road (South of Cairncross WMF)	Day	61.0	62.2	61.0	62.3	60	0.0	0.1

[1] Day = 7.00am – 10.00pm

8.7.3 **Mitigation measures**

The noise impact assessment has demonstrated the noise levels from the day-to-day operational activities within the Proposal Site are predicted to comply with the established criterion at all nearby residential receivers. The assessment of potential road traffic noise impacts found that increases in associated noise levels, are predicted to be well below 2 dBA, and, in accordance with the RNP, no mitigation is necessary.

Notwithstanding this, mitigation measures are identified in Table 8-37 to further reduce noise emissions associated with the Proposal Site.

Table 8-37 Noise mitigation measures

ID	Mitigation measures	Timing
N-01	Implement requirements for on-going maintenance of fixed and mobile plant in accordance with manufacturers specifications, ensuring silencers are fitted where reasonably practicable and considering replacing tonal reversing alarms with broadband devices on all site-owned plant.	Construction / operation
N-02	Awareness training would be provided for staff and contractors for managing environmental noise issues including: • Ensuring that vehicles don't queue at the site entrance prior to opening • Limiting unnecessary idling of plant • Minimising the use of horn signals and maintaining a low volume.	Pre-construction / construction / operation

8.8 Traffic

A traffic assessment was undertaken to determine the impacts of the Proposal on the surrounding road network. The detailed assessment report is provided in Appendix J. This section summarises the impacts associated with the Proposal on traffic and related mitigation measures.

Table 8-38 provides a summary of the SEARs related to traffic and where these have been addressed in this EIS.

Table 8-38 SEARs relevant to traffic

SEAR	Where addressed in EIS?
Traffic – including:	Section 8.8
• Details of all traffic types and volumes likely to be generated;	Section 8.8.2
• Assessment of predicted impacts on road safety and the capacity of the road network to accommodate the project; and	Section 8.8.2
• Assessment of where off site infrastructure works are required as a result of traffic impacts.	Section 8.8.2

8.8.1 Existing environment

The PMHC LGA, including the major townships of Port Macquarie, Kempsey, Wauchope and Camden Haven, currently has access to the Cairncross WMF as the primary waste disposal facility. Customer and waste disposal vehicles currently access the Cairncross WMF via Cairncross WMF Access Road.

This section describes the existing road network surrounding the site, existing traffic volume on the network and predicted traffic volumes and road network performance in the future, without the Proposal. Section 8.8.2 outlines the predicted traffic volumes in the future, with the Proposal.

Surrounding road network

Access to the Proposal Site is shown on Figure 8-20 and includes:

- Pacific Highway (to be referred to as the 'local council road' beyond 2017, following establishment of the 'new' Pacific Highway); and
- Cairncross WMF Access Road.

Pacific Highway

The Pacific Highway is a state controlled road and is managed by Roads and Maritime. It is a sealed road with a total length of 620 kilometres. The majority of the Pacific Highway between Hexham, NSW and the Queensland border is a four-lane divided carriageway with a speed limit of 110km/hr. The section of the Pacific Highway providing access to the Propsal Site is a two-lane carriageway with an existing speed limit of 100km/h approaching the site from both directions.

Cairncross WMF Access Road

Cairncross WMF is a local road that is managed by PMHC. The road has a width of seven metres and is two kilometres in length, from its intersection with the Pacific Highway and the Cairncross WMF.

The intersection of the Pacific Highway and the Cairncross WMF Access Road is referred to herein as the Study Intersection.

Figure 8-20 Location of the Cairncross WMF and surrounding road network

Existing traffic conditions

Existing traffic volumes

A quantitative assessment was conducted to determine existing traffic conditions using the follow data sources:

- Roads and Maritime annual average daily traffic (AADT) Station ID 6126 located 730 metres North of Glen Ewan Road, Blackmans Point 2444 – April to December 2015 to determine northbound and southbound traffic on Pacific Highway for existing scenario assessment
- Roads and Maritime AADT Station ID 6128-PR located 110 metres North of Ryans Road, Lake Innes 2446 – April to December 2015 to determine proportion of northbound traffic to southbound traffic
- Port Macquarie-Hastings Council Cairncross WMF Weighbridge Data – January to December 2015 to determine traffic accessing the Cairncross WMF.

The traffic data was analysed to determine the average weekday and weekend traffic volumes and typical peak hour volumes by direction. Table 8-39 summarises indicative traffic volumes derived from the traffic count data.

Table 8-39 Average daily traffic volumes (2015)

Location	Weekday			Weekend		
	Total EB/SB* (%HV)	**Total WB/NB* (%HV)**	**Total Bi-Directional (%HV)**	**Total EB/SB* (%HV)**	**Total WB/NB* (%HV)**	**Total Bi-Directional (%HV)**
Pacific Highway (730m North of Glen Ewan Road, Blackmans Point)	8,181 (24%)	8,483 (24%)	16,664 (24%)	6,091 (15%)	5,547 (13%)	11,637 (14%)
Cairncross WMF Access Road (at weighbridge)	111 (79%)	111 (79%)	222 (79%)	38 (54%)	38 (54%)	76 (54%)

Note: * EB = east-bound, SB = south-bound, WB = west-bound, NB = north-bound

Based on the 2015 Roads and Maritime count data, approximately 24 percent of traffic along the Pacific Highway on an average weekday comprises of heavy vehicles, compared to approximately 79 percent of traffic accessing Cairncross WMF. Traffic along the Pacific Highway on the weekend comprises approximately 14 percent heavy vehicles compared to approximately 54 percent of traffic accessing Cairncross WMF.

A peak hour analysis for the Proposal's Study Intersection was undertaken by combining the average daily traffic volumes for the Pacific Highway and Cairncross WMF Access Road. Figure 8-21 presents the hourly profile for the weekday and weekend traffic volumes. The traffic volume peaks were determined as follows:

- Weekday AM peak occurs from 8:00am to 9:00am
- Weekday PM peak occurs from 4:00pm to 5:00pm
- Weekend peak occurs from 1:00am to 12:00pm.

The peak hours at the Study Intersection were predominantly influenced by traffic travelling northbound and southbound on the Pacific Highway, suggesting traffic accessing the Cairncross WMF does not largely contribute to peak traffic volumes.

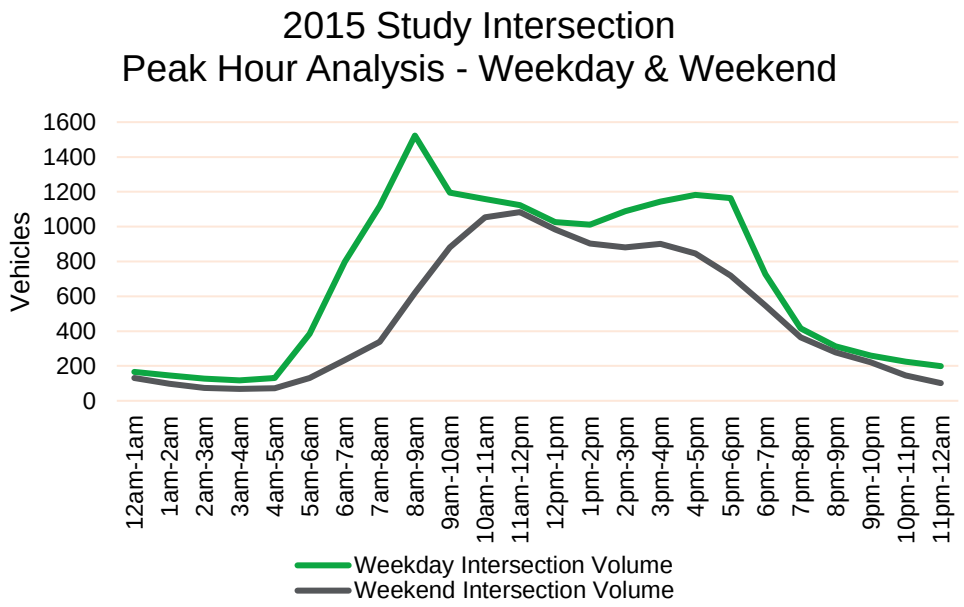


Figure 8-21 Hourly traffic volume profile

Roadway capacity for two-lane two-way highway

The *Austroads Guide to Traffic Engineering Practice Part 2: Roadway capacity* (Austroads Guide) defines Level of Service (LOS) as a qualitative measure describing operational conditions within a traffic stream. The volume and composition of traffic on a given road determines the level of interaction between vehicles and is measured as its LOS. For a particular roadway capacity, the LOS deteriorates with increasing traffic volumes.

The Austroads Guide provides planning guidance on maximum AADT values that two-lane, two-way rural roads can accommodate under various terrain conditions. Based on traffic count data adopted for the assessment, a design hour volume to AADT ratio of 0.10 is relevant to the Proposal. The Pacific Highway has a reported ADT of 16,664 and 11,637 vehicles per day for the weekday and weekend, respectively, which is equivalent to an operational capacity of LOS D and LOS C, respectively. This indicates that the existing Pacific Highway has a mostly stable flow with some delays for the weekday and stable flow with spare capacity to accommodate additional traffic for the weekend.

The Pacific Highway upgrade between the Oxley Highway and Kempsey will divert a large proportion of traffic to a new alignment (see Figure 8-20). Following the upgrade/realignment of the Pacific Highway (completion expected end 2017) the section of the Pacific Highway located at the intersection with the Cairncross WMF Access Road will become a local council road. The realignment of the Pacific Highway would reduce traffic volumes by an estimated 86 percent in the year of opening (2020) and 85 percent in the final year of operation (2056) of the Proposal. This future reduction in traffic volumes would improve the LOS at the Study Intersection to LOS A for both the 2020 and 2056 year, indicating that the local council road would have a free, unrestricted flow.

8.8.2 **Assessment of impacts**

Construction of the Proposal will be undertaken using the same equipment which is used for operation of the landfill (e.g. excavators and compactors). This equipment is permanently located on-site and therefore no construction related traffic will be generated on the external road network and no construction traffic impact assessment was warranted.

The following operational impacts have been assessed using modelling scenarios to predict potential traffic changes:

- Traffic generation
- Impacts to the road network
- Road safety.

Operational traffic generated by the Proposal has been assessed using the following three scenarios:

- Existing year (Proposal not operating) – 2017: Weekday AM Peak, Weekday PM Peak and Weekend Peak
- Opening year (commencement of Stage 1) – 2020: Weekday AM Peak, Weekday PM Peak and Weekend Peak
- Closing year (conclusion of Stage 3) – 2056: Weekday AM Peak, Weekday PM Peak and Weekend Peak.

Traffic flows

Traffic related to the Proposal would primarily comprise heavy vehicles (typically Austroads Class 5 - Four Axel trucks) with a smaller percentage of light vehicles accessing the site. Peak volumes have been determined based on existing vehicle access patterns at the Cairncross WMF which is based on weighbridge data provided by PMHC. A 3.36 percent annual compound growth rate was applied to existing landfill traffic volumes to predict future traffic volumes.

Daily volumes

Table 8-40 includes the average weekday and weekend vehicle trips associated with the existing landfill for the year of 2017, 2020 and 2056. The total number of two-way trips during the week is predicted to increase by 12 percent in 2020 and almost fourfold by 2056, in comparison to the current year. The total number of two-way trips during the weekend is predicted to increase by 11 percent in 2020 and by 67 percent by 2056, in comparison to the current year.

Table 8-40 Waste disposal traffic generation (two-way trips/day)

Vehicle Type	Existing Year (2017)		Opening Year (2020)		Closing Year (2056)	
	Average Weekday	**Average Weekend**	**Average Weekday**	**Average Weekend**	**Average Weekday**	**Average Weekend**
LV	11	8	13	9	41	37
HV	70	27	78	30	255	98
Total	81	35	91	39	296	135

Peak volumes

Table 8-41 includes the breakdown of traffic generated by the Proposal for the weekday AM and PM peak, as well as the weekend peak. Proposal related traffic is anticipated to access the site outside of the peak hours identified for the study Intersection (which are more heavily influenced by through-traffic on the Pacific Highway) and will therefore have no impact on the traffic flows during peak periods.

Table 8-41 Waste disposal traffic generation (two-way trips/peak period)

Peak Period	Existing Year (2017)			Opening Year (2020)			Closing Year (2056)		
	LV	**HV**	**Total**	**LV**	**HV**	**Total**	**LV**	**HV**	**Total**
Weekday AM peak (8:00am-9:00am)	5*	10*	15	5*	10*	15	5*	24	23
Weekday PM peak (4:00pm-5:00pm)	5**	5**	10	5**	5**	10	5**	5**	10
Weekend peak (11:00am-12:00pm)	5*	5*	10	5*	5*	10	5	10*	15

Note: *Due to peak hour volumes being low, more conservative volumes were used. If the calculated trips were less than five trips, the trips were rounded up to five. Any trips greater than five and less than ten were rounded up to ten for a conservative assessment.

** For the weekday PM peak, there were zero vehicles observed accessing the site. A nominal figure of 5 vehicles per hour was adopted for the purpose of the assessment in the SIDRA modelling, as a worst-case assumption.

Impacts to the road network

The overall Proposal impact on the road network has taken into consideration the impact on the Study Intersection and capacity on the new Pacific Highway interchanges.

Study Intersection

An analysis of the likely impact the Proposal would have on the Study Intersection has been undertaken using traffic analysis software (SIDRA version 7). The SIDRA assessment was undertaken for the three peak periods previously described. Table 8-42 shows the delay and LOS results from SIDRA at the Study Intersection for all assessment years and peak periods.

Table 8-42 SIDRA summary results for the Study Intersection

Year	Weekday AM peak (8:00am-9:00am)			Weekday PM peak (4:00pm-5:00pm)			Weekend peak (11:00am-12:00pm)		
	Volume (Vehs/hr)	**Delay (s)**	**LOS**	**Volume (Vehs/hr)**	**Delay (s)**	**LOS**	**Volume (Vehs/hr)**	**Delay (s)**	**LOS**
Existing Year (2017)	1,741	>200	F*	1,359	>200	F*	1,240	>200	F*
Opening Year (2020)	275	10	A	201	9	A	266	10	A
Closing Year (2056)	337	13	A	226	10	A	311	10	A

Note: * LOS F estimated for the minor east/west approaches at the intersection

The SIDRA model predicts an LOS F at the Study Intersection for the current year, in all peak periods, and a LOS A in both the opening and closing year, in all peak

periods. While the Proposal will result in additional landfill related traffic travelling through the Study Intersection to access the Proposal Site, this increase, and associated impacts on the intersection, is offset by the significant reduction in through-traffic associated with the realignment of the Pacific Highway.

New Pacific Highway interchanges

A qualitative assessment was conducted to identify potential impacts from the Proposal on the new Pacific Highway interchanges (including Blackmans Point Road interchange 3.6 kilometres south of the Study Intersection and Haydons Wharf Road interchange 7.4 kilometres north of the Study Intersection).

It is anticipated the Proposal would result in a relatively small increase in the number of trips at Blackmans Point Road interchange: an increase of approximately four percent in the year 2020 and nine percent in the year 2056. It is anticipated the Proposal would result in a relatively small increase in the number of trips at the Haydons Wharf Road interchange: an increase of approximately five percent in the year 2020 and 13 percent in the year 2056. The Proposal is therefore considered to have a minimal impact on the operation of both interchanges.

Road safety

A high level assessment of road safety was undertaken, taking into account required sight distances and observations made by PMHC. The site distance assessment was based on required sight distances outlined in the *Austroads Guide to Road Design, Part 4A: Unsignalised and Signalised Intersections* (Austroads, 2010), which specifies the following:

Approach Sight Distance (ASD)

This is the minimum requirement to provide the driver of a vehicle adequate distance to observe the road layout, including pavement markings, kerbs, islands, etc. in sufficient time to react and stop if necessary before entering the conflict area. Approach Sight Distance is measured from driver eye height (1.05m) to 0.0m (i.e. the road surface).

Safe Intersection Sight Distance (SISD)

This provides sufficient sight distance for a driver of a vehicle on the major road to observe a vehicle from the minor road approach moving into a collision situation (e.g. in the worst case stalling across the traffic lanes), and to decelerate to stop before reaching the collision point. Safe Intersection Sight Distance is measured from the driver eye height (1.05) on the approach with priority to eye height of a driver in the side street (1.05m).

The ASD and SISD requirements for vehicles approaching and departing the Study Intersection were determined based on a vehicle speed of 100km/h. The *required* sight distances for both northbound and southbound movements are 165 metres (ASD) and 248 metres (SISD). The *available* sight distances range between 300 and 400 metres. Therefore, the Study Intersection satisfies the ASD and SISD requirements.

In addition to the sight distance assessment, observations were made by PMHC during the collection of site distance photos, of occasional vehicles cutting the corner when making right-hand turns out of the Cairncross WMF Access Road. This matter was also raised by Roads and Maritime Services, during consultation about the Proposal, with a request for consideration of this matter as part of this traffic impact assessment. Crash data between 2011 and 2016 was provided by Roads and Maritime and revealed that no crashes have been recorded at the Study Intersection in the last five years (2011 – 2016). Mitigation measures have been developed to address this site observation and potential road safety issue and are included in Section 8.8.3.

Off-site infrastructure requirements

Based on the above assessment, no road infrastructure upgrades are required due to Proposal traffic.

8.8.3 Mitigation measures

Table 8-43 identifies safeguards and management measures that will be implemented to address potential traffic impacts associated with the Proposal. Safeguards and management measures are recommended in line with the relevant objectives and principles set out in the 1999 EIS and the Cairncross WMF OEMP (PMHC, 2008).

Table 8-43 Traffic mitigation measures

ID	Mitigation measures	Timing
T-01	Standard Operating Procedures (SOPs) to educate waste collection contractors/ heavy-vehicle drivers about appropriate exit procedures and avoidance of corner-cutting when exiting the Cairncross WMF Access Road would be developed	Operation

8.9 Greenhouse gas

A Greenhouse Gas (GHG) assessment was undertaken by Arcadis to quantify the likely GHG emissions that may be produced by the Proposal. The detailed assessment report is provided in Appendix R. This section provides a summary of the findings of the assessment in relation to the potential for GHG production associated with the Proposal and related mitigation measures.

Table 8-44 provides a summary of the relevant SEARs, which relate to GHG emissions and where these have been addressed in this EIS.

Table 8-44 SEARs relevant to greenhouse gas

SEAR	Where addressed in EIS?
• A quantitative assessment of the scope 1, 2 and 3 greenhouse gas emissions of the project;	Section 8.9.3 Appendix R - Greenhouse Gas Assessment
• A detailed description of the measures that would be implemented to minimise the methane emissions of the proposed landfill operations and ensure that the project is energy efficient.	Section 8.9.4 Appendix R - Greenhouse Gas Assessment

8.9.1 Methodology

The scoping processes used for the assessment of GHG emissions for the Proposal has been based on the following guidelines and regulations:

- The World Resources Institute/World Business Council for Sustainable Development (WRI/WBCSD) *The Greenhouse Gas Protocol – A Corporate Accounting and Reporting Standard Revised Edition* (WRI/WBCSD, 2004)
- *National Greenhouse and Energy Reporting (Measurement) Determination 2008* (DoE, 2014a)
- The Department of Environment (DoE) *National Greenhouse and Energy Reporting System Measurement: Technical Guidelines for the Estimation of Greenhouse Gas Emissions by Facilities in Australi*a (DoE, 2014b)
- *National Greenhouse Accounts (NGA) Factors* (DoE, 2016a).

Under 'The Greenhouse Gas Protocol' (WRI/WBCSD, 2004), a Proposal's direct and indirect emissions sources can be delineated into three 'scopes' (Scope 1 (direct), Scope 2 (indirect) and Scope 3 (indirect)) for GHG accounting and reporting purposes.

Quantification of potential emissions from the Proposal has been undertaken in relation to carbon dioxide (CO_2) and other non-CO_2 GHG emissions, including methane (CH_4), and nitrous oxide (N_2O). All emissions are reported as carbon dioxide equivalents (CO_2-e).

8.9.2 Existing environment

Existing accounts of greenhouse gases provided by the Commonwealth Department of the Environment (DoE) estimate that approximately 523.3 Mega tonnes (Mt) CO_2-e were emitted in Australia during the 2013-14 financial year (DoE, 2016c).

As per the Intergovernmental Panel on Climate Change (IPCC), and reported within Australia's Greenhouse Gas Inventory (Ageis.climatechange.gov.au, 2014), solid waste disposal forms a sub-sector of the waste disposal sector. The combined waste

disposal subsectors (including solid waste disposal) were the second smallest generators of GHG sector emissions in Australia in 2014, comprising just 2.3 percent of Australia's total emissions (523.3 Mt) (DoE, 2016b).

The solid waste disposal sector accounted for 1.7 percent (8.9 $MtCO_2$-e) of Australia's GHG emissions in 2014 and 3.1 percent of total GHG emissions in NSW (DoE, 2016b). Approximately 74.3 percent of emissions produced by the waste sector are attributable to the solid waste disposal subsector. Further, trend analysis of the sector shows that since 1990 net GHG emissions from the NSW waste sector have declined by 44 percent while nationally emissions have dropped by 39 percent.

The existing landfill (Stage E) at Cairncross is currently operating and generates GHG emissions from waste previously, and presently, received. Stage E is scheduled to continue to accept waste until 2020 and does not form part of this Proposal. However, waste deposited in Stage E will continue to produce methane well into the Proposal's lifecycle. Emissions produced from the decomposition of putrescible waste deposited within Stage E prior to the commencement of the Proposal (referred to as legacy emissions) would generate over 580,000 tCO_2-e over the waste decomposition lifecycle.

Emissions generated from legacy waste, per tonne, would likely be greater than those produced by waste received as part of the Proposal. This would largely be a result of the composition of waste historically received at the Cairncross landfill which previously contained a greater portion of organic waste. The future composition of waste is likely to have a lower organic content due to an increase in FOGO services.

Stage E does not include a landfill gas capture or flaring system, however PMHC are currently investigating the viability of landfill gas capture or flaring. Should the results be positive the installation of a flare or generator technology at Cairncross landfill may minimise emissions in the future, including those generated from legacy waste.

8.9.3 Assessment of impacts

The Proposal would be undertaken in three key stages over a period of 36 years. Construction and operation of the site would occur concurrently and would include construction, landfilling, capping and closure of each landfill cell. These activities require the use of fuels, vegetation clearing, transportation and waste storage which would result in associated GHG emissions. Where relevant, this section reports the GHG emissions for the Proposal based on both the stage in which they occur and the source of the emissions.

The Proposal would generate emissions from:

- Machinery used during construction and operation
- Vegetation clearing
- Transportation
- Waste decomposition.

Machinery

Section 5.9 describes the machinery that would be used to operate the Cairncross landfill. The use of machinery on-site would generate Scope 1 GHG emissions from fuel combustion (diesel). Additionally, the upstream and downstream emissions associated with the production of fuel would be incurred as a result of onsite machinery use. This would represent a Scope 3 GHG emission for the Proposal. As shown in Table 8-45 emissions per annum (within the highest emitting year for each stage) would range between 275 tCO_2-e per annum for Stage 1, to 824 tCO_2-e per annum in Stage 3. The average yearly machinery emissions for the Proposal overall are 551 tCO_2-e per annum in Scope 1 emissions and 28 tCO_2-e per annum in Scope 3 emissions.

Table 8-45 Summary of GHG emissions generated from the operation of on-site machinery

Emissions source	On-site machinery (tCO_2-e/yr) highest emitting year (tCO_2-e)		
	Scope 1	Scope 2	Scope 3
Stage 1 – 2040	262	-	13
Stage 2 – 2047	606	-	31
Stage 3 – 2056	784	-	40
Average annual emissions (Stages 1-3)	**551**	**-**	**28**

Vegetation clearing

Vegetation clearing would generate emissions from a number of potential sources; including the loss of carbon sequestration, diesel consumption in machinery used (assessed above) for clearing and mulching, and vegetation decomposition.

Approximately 3.4 hectares of vegetation would need to be cleared as part of the Proposal to prepare the Stage 3 site for landfilling[17]. Clearing would commence late in Stage 2 (in approximately 2046) to enable commencement of landfilling in Stage 3 in 2047.

Total emissions from vegetation clearing are estimated to be 1,402 tCO_2-e as shown in Table 8-46.

Table 8-46 Summary of GHG emissions (tCO_2-e) arising from cleared vegetation

Emissions source	Total emissions due to vegetation clearing (tCO_2-e)		
	Scope 1	Scope 2	Scope 3
Loss of carbon sequestration	1,360	-	-
Emissions from vegetation disposal	42	-	-
TOTAL	**1,402**	**-**	**-**

Transportation

Movement of waste between the originating location and the Proposal Site would generate GHG emissions as a result of fuel combustion within transportation vehicles, as well as upstream and downstream emissions associated with the production of fuel. Waste collection would predominantly be undertaken by third party contractors, and therefore represents a Scope 3 emissions source.

In the highest emitting year for Stage 1 (2040), the Proposal would generate approximately 1,128 tCO_2-e of Scope 3 emissions. In the highest emitting year for Stage 2 (2047), the Proposal would generate approximately 1,451 tCO_2-e Scope 3 emissions. In the highest emitting year for Stage 3 (2056), the Proposal would

[17] Note: the 3.4 ha of vegetation to be cleared as part of the Proposal is located within the Stage 3 landfilling area. As explained in Section 8.2, clearing of other vegetation on the Proposal Site is subject to a separate approval and does not form part of the Proposal. Therefore, only the GHG emissions from the clearing of the 3.4 ha of vegetation subject to the Proposal is considered within this GHG assessment.

generate approximately 1,913 tCO2-e Scope 3 emissions. This is summarised below in Table 8-47.

Table 8-47 Summary of waste collection vehicles emissions (tCO_2-e)

Emissions source / highest emitting year	Waste collection vehicles - highest emitting year (tCO_2-e)		
	Scope 1	Scope 2	Scope 3
Stage 1 – 2040	-	-	1,128
Stage 2 – 2047	-	-	1,451
Stage 3 – 2056	-	-	1,913
Average annual emissions (Stages 1-3)	-	**-**	**1,487**

Waste decomposition

Decomposition of putrescible waste on-site would be the most substantial emissions source over the life of the Proposal. GHG emissions produced from waste decomposition has been assessed using a worst case scenario of zero methane gas capture, despite the potential for installation of a gas capture/flaring system at the Proposal Site in future. All waste decomposition would occur on-site and is therefore regarded as a source of Scope 1 emissions. Legacy emissions have been included in the below calculations to ensure a complete picture of methane generation is presented. Even though waste generated during Stage E has already been approved and therefore does not form part of this Proposal[18].

MSW is expected to be the largest source of methane emissions within the Proposal. Annual waste emissions are predicted to increase substantially as the Proposal progresses in its lifecycle due to the increase in the annual waste acceptance rate and the nature of GHG generation over the waste decomposition lifecycle. Table 8-48 shows that total waste emissions would be expected to peak at 122,161 tCO_2-e in 2057, one year after the closure of the landfill.

[18] The existing landfill (Stage E) is already approved and operational and therefore does not form part of the Proposal. However, the GHG emissions from Stage E ('legacy emissions') have been considered within this assessment due to the lag times associated with GHG generation, the potential to manage emissions from Stage E collectively with those from Stages 1-3 and a proactive management approach by PMHC in addressing these emissions from the entire landfill.

Table 8-48 GHG emissions from waste decomposition

Emissions source / highest emitting year	Waste decomposition emissions in the worst emitting year (tCO_2-e)			
	Scope 1	Scope 2	Scope 3	Percent of emissions from legacy waste (%)
Stage 1 - 2040	61,478	-	-	5.5%
Stage 2 - 2047	80,814	-	-	2.8%
Stage 3 - 2057	122, 161	-	-	1.2%
Annual average emissions (Stages 1-3)	**65,041**			10%

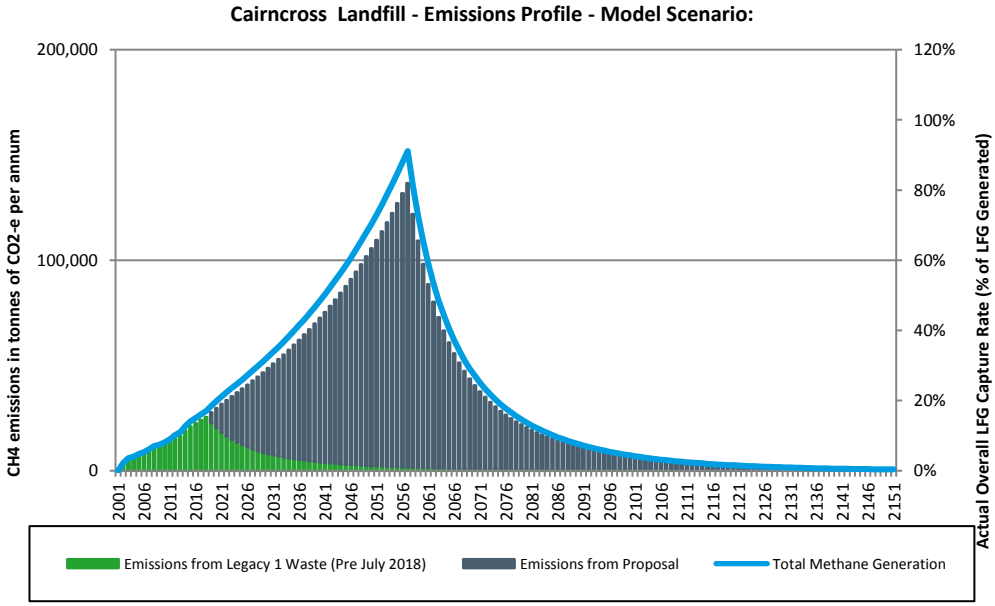


Figure 8-22 Landfill emissions profile for the Proposal, including legacy waste

Overall GHG emissions from the Proposal, when considering all key emissions sources, are at their highest emitting point of a total of approximately 124,000 tCO_2-e/pa in the year 2058 after Stage 3 has reached capacity. This represents approximately 0.03 percent of Australia's total annual GHG emissions (as at 2017) and 0.1 percent of NSW's total emissions.

As noted in Section Figure 5-7, PMHC are currently conducting a landfill gas pumping trial at Cairncross WMF to confirm the actual rate of methane generation from a 'typical' zone within the landfill, the concentration of methane during active extraction, and provide a forecast of future extraction rates / concentrations within the landfill. The trial will also make recommendations on the future landfill gas management at the site. It is expected that the trial will be completed by late-2017.

The extent of gas controls to be designed and implemented for the existing and future stages of landfill will be guided by the results of the gas pumping trial. PMHC will

develop a landfill gas management plan based on the findings of the trial. Mitigation measures will also be designed around the results of this trial.

The emissions profile shows that the most substantial emissions would occur in the later stages of the Proposal. This provides the opportunity for gas capture technologies to become both more technologically advanced and economically viable. Therefore, an opportunity potentially exists to substantially reduce the emissions profile of the Proposal over its lifetime, particularly its later peak, through the future installation of landfill gas or flaring technology.

8.9.4 **Mitigation measures**

The GHG assessment has identified the projected GHG emission that would be produced as a result of the Proposal. Mitigation measures are identified in Table 8-49 to reduce GHG emissions associated with the Proposal.

Table 8-49 GHG mitigation measures

ID	Mitigation measures	Timing
GHG-01	Project planning would be undertaken to ensure that on-site vehicle movements and construction activities are efficient, avoid double handling of materials and avoid unnecessary fuel use.	Pre-construction / construction / operation
GHG-02	A landfill gas monitoring program would be undertaken for Stages 1 to 3	Pre-construction / construction / operation
GHG-03	A landfill gas management plan based on the findings of the 2017 landfill gas pumping trial would be developed. The extent of landfill gas controls to be designed and implemented for the existing and proposed stages of the landfill would be guided by the results of the gas pumping trial. If feasible, the implementation of a gas capture or flaring system will be considered.	Pre-construction / construction / operation

8.10 Aboriginal heritage

An Aboriginal heritage assessment was undertaken by Adise to determine the Aboriginal heritage significance of the Proposal site as well as the likely opportunities and constraints in respect of the Proposal. The assessment was undertaken in accordance with the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales*, introduced in October 2010 by the OEH. The detailed assessment report is provided in Appendix E. This section provides a summary of the findings of the assessment in relation to potential impacts associated with the Proposal on Aboriginal heritage and related mitigation measures.

Table 8-50 provides a summary of the relevant SEARs, which relate to aboriginal heritage and where these have been addressed in this EIS.

Table 8-50 SEARs relevant to Aboriginal heritage

SEAR	Where addressed in EIS?
Aboriginal	Section 8.10

8.10.1 Existing environment

The study area for the Aboriginal heritage assessment is shown in Figure 8-23, including locations of previously registered Aboriginal sites. The assessment included background research, targeted visual surveys in areas of exposure and observations of deposits and landforms to identify areas of potential archaeological deposits (PADs).

In addition to the most recent study undertaken by Adise in 2016, a number of previous heritage surveys and assessments have been conducted in and around the study area, dating from Packard (1992) to Kelleher Nightingale (2012). These assessments were relied upon as part of the Adise assessment and details of these studies are provided in Appendix E.

The most recent field surveys of the Proposal Site were conducted on 13 May 2016 with a representative from the Dunghutti Elders, and on 20 June 2016 with the Birpai LALC sites officer. Adise carried out an additional site visit on 26 June 2016 to undertake a pedestrian survey of the Proposal Site and inspect the route of the historic ‘old road’ (discussed further below).

No Aboriginal objects or PADs were identified during the survey. Additionally, as the study area has been cleared of old growth native trees, no trees suitable for cultural modification were identified during site survey.

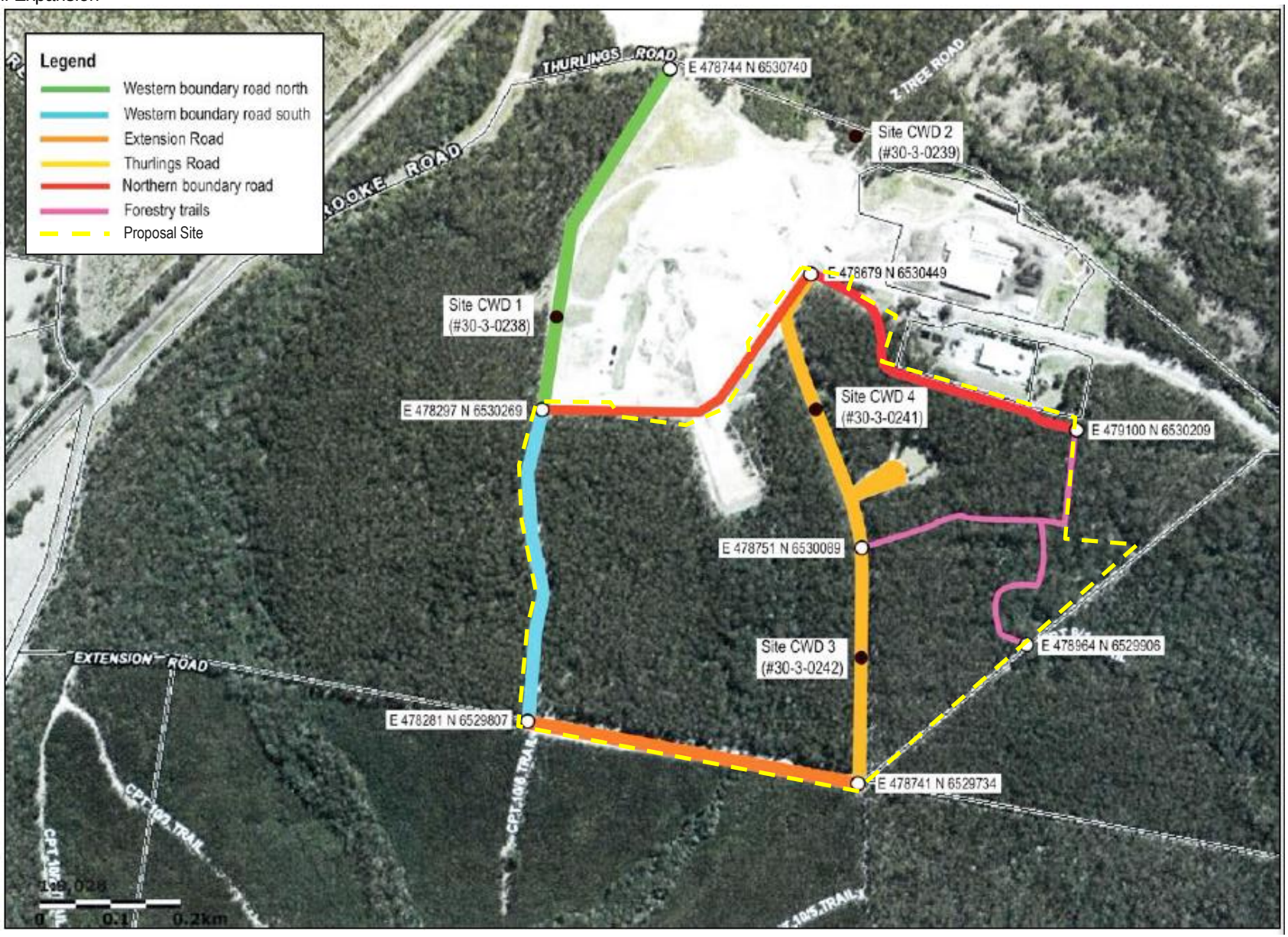


Figure 8-23 Locations of previously registered Aboriginal sites (Source: Adise, 2016)

An extensive search of the Aboriginal Heritage Information Management System (AHIMS) site register was requested on 18 June 2016 and revealed 28 registered sites within a five kilometre radius of the Proposal Site including three within the Proposal Site (Figure 8-24): CWD 1, CWD 3 and CWD 4.

CWD 1 was destroyed under a Consent to Destroy (with Salvage) issued to PMHC on the 5 June 2000 (#N37/CDS/2000) under Section 90 of the *National Parks and Wildlife Act 1974*. The artefacts were collected and retained by the Birpai LALC under a Care and Control Permit (Collins, 1998).

CWD 3 and CWD 4 were recorded in 1998 as part of the investigations for the existing landfill. These sites together comprised four visible artefacts (all unmodified flakes), in a disturbed condition on and beside a forestry road, and were assessed to be of low scientific/archaeological significance. The present assessment found CWD 3 and CWD 4 to have been further disturbed by more recent road upgrading, with an absence of detectable artefacts either on the road, the road verges or adjacent clearings. These recent findings support the 1998 contention that sites CWD 3 and CWD 4 have limited archaeological potential and low scientific/archaeological significance. Nevertheless, the recorded CWD 3 and CWD 4 artefacts are expected to remain somewhere within each of the registered localities.

Two of these registered sites are stone artefact scatter and the other two were destroyed by development of the WMF. PMHC was authorised a Consent to Destroy for the latter artefacts, which were collected and retained by the Birpai LALC under a Care and Control Permit (Collins, 1998).

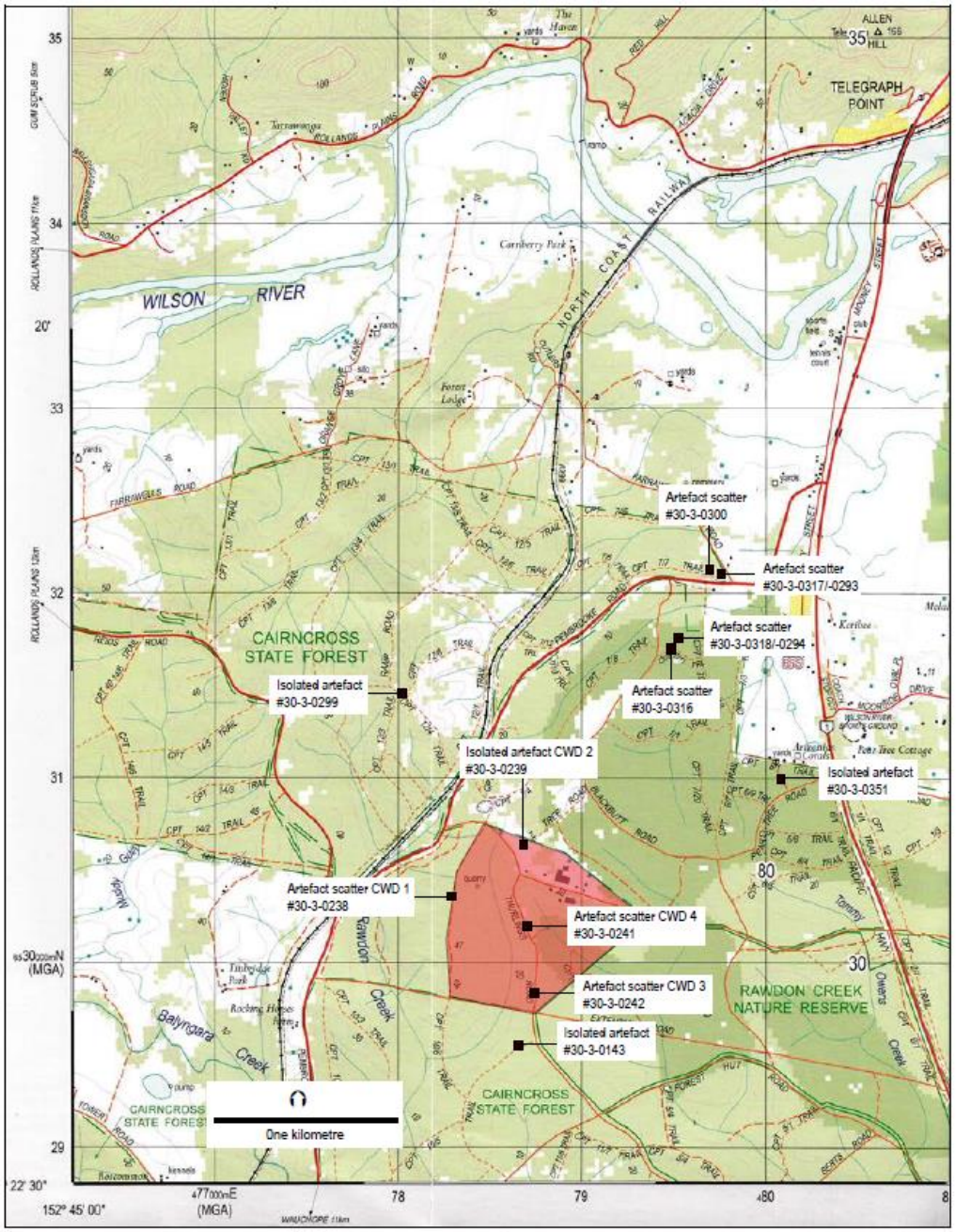


Figure 8-24 Location of registered Aboriginal sites within five kilometres of the Proposal Site (Cairncross WMF shaded red) (Source: Adise, 2016)

8.10.2 **Assessment of impacts**

As mentioned above, there are two remaining Aboriginal sites within the Proposal Site (CWD 3 and CWD 4). Given the location of the sites, the previous disturbance and the absence of any other detectable artefacts in the vicinity, the sites have been assessed as having a low level of archaeological potential (Collins, 1998). The current assessment (Adise, 2016) found that the sites have been subject to further disturbance by more recent road upgrading and supports the previous findings that

the sites have limited archaeological potential or significance. It is anticipated that these sites will be destroyed during the construction of the Proposal[19].

The background data and survey results indicate that the Proposal Site is highly unlikely to have ever contained dense artefact occurrences, however there is potential for construction to impact on small unidentified artefact scatters or isolated artefacts. If any unidentified artefacts are encountered, they will have been previously disturbed and displaced, and will therefore have no possible scientific/archaeological or aesthetic value.

8.10.3 **Mitigation measures**

Given the altered state of the Proposal Site and lack of archaeological potential, proposed mitigation would focus on a procedure for the management of unexpected archaeological finds and would be documented within the OEMP for the Proposal. A summary of the Aboriginal heritage mitigation measures is provided in Table 8-51.

Operation of the Proposal is not expected to impact on known items of Aboriginal heritage; therefore, no mitigation measures related to impacts to Aboriginal heritage are required for the operation of the Proposal.

Table 8-51 Aboriginal heritage mitigation measures

ID	Mitigation measures	Timing
AB-01	Prior to their on-site involvement, all personnel engaged for tree clearing and topsoil stripping would undergo a general site induction prior to their on-site involvement that provides information on legal obligations with respect to Aboriginal objects, including 'stop-work' conditions applicable in the event that any identified or suspected heritage objects are discovered at any time	Pre-construction / construction / operation
AB- 02	In the event that any identified or suspected Aboriginal objects are detected at any time, all disturbance work should immediately cease within 20m of the find and temporary protective fencing erected around this 'no-go zone' pending further management advice from the OEH (Planning and Aboriginal Heritage Section, North Coast Region). If the find consists of or includes human remains, the NSW Police Department and NSW Coroner's office would be contacted. If the burial is identified as being of Aboriginal origin a heritage professional and NSW OEH would be contacted to determine the subsequent course of action.	Pre-construction / construction / operation
AB-03	PMHC would provide the OEH AHIMS Registrar with Aboriginal Site Impact Recording Forms for sites CWD 3 and CWD 4 once these sites are affected by the Proposal.	Pre-construction / construction / operation

8.11 Non-Aboriginal heritage

An assessment of potential impacts of the Proposal on non-Aboriginal heritage was undertaken by Adise (archaeological consultant) (Appendix E). A summary of the findings is provided below. This assessment was prepared based on:

[19] An Aboriginal Heritage Impact Permit (AHIP) under section 90 of the NPW Act 1974, or an approval under Part 4 or an Excavation Permit under section 139 of the *Heritage Act 1977* is not required for SSD that is authorised by a development consent.

- A desktop assessment which included a review of key legislation (*Heritage Act 1977* (Heritage Act) and PMHC LEP 2011) and online heritage database searches
- Previous non-Aboriginal heritage assessments of the project area including the assessment conducted for the 1999 EIS.

A site survey was conducted on 26 July 2016 to inspect the Proposal Site. The following publicly available local, state, national and world heritage databases were searched on 24 June 2016 as part of this assessment:

- EPBC Protected Matters Search Tool
- State Heritage Register and Inventory (NSW Heritage Office)
- Port Macquarie Hastings Council LEP 2011.

Table 8-52 provides a summary of the relevant SEARs, which relate to non-Aboriginal heritage and where these have been addressed in this EIS.

Table 8-52 SEARs relevant to non-Aboriginal heritage

SEAR	Where addressed in EIS?
Non-Aboriginal	Section 8.11

8.11.1 Existing environment

Prior to transfer of ownership to PMHC, the Proposal Site comprised part of Cairncross State Forest. Most of the Proposal Site has previously been disturbed during clearance of natural forest to accommodate hardwood forestry plantations that were established between 1976 and 1977.

The investigations by Adise revealed that no items of local, state or national heritage significance are located within one kilometre of the Proposal Site. This is likely due to the limited historical non-Aboriginal land uses and the extent of previous modern forestry disturbance in the area.

The 1999 EIS identified one possible significant historical site/relic within the Proposal Site: an apparently convict built 'old road'. Traces of this road were identified between the Pacific Highway and the Cairncross WMF, however it was concluded that most of the road had been obliterated by forestry activities. No evidence of the road was identified during the field assessment of the section of road traversing the Cairncross WMF, including the present Proposal Site.

A number of historical structures at, and in the vicinity of, Telegraph Point (approximately five kilometres to the north-east) have been identified for special heritage management under the PMHC LEP. None of these structures would be directly or indirectly affected by the Proposal.

8.11.2 Assessment of impacts

Due to the distance between the Proposal Site and the nearest non-Aboriginal heritage items, no direct physical impacts on any items of non-Aboriginal heritage are anticipated. Furthermore, the Proposal Site has been assessed as having a negligible chance of containing any non-Aboriginal relics or artefacts.

8.11.3 Mitigation measures

While no direct impacts are expected to occur to non-Aboriginal heritage items, and the site is considered to be highly disturbed, the mitigation measures outlined in Table 8-53 will be employed to ensure protection of any unexpected finds during construction of the Proposal.

Operation of the Proposal is not expected to impact on known items of non-Aboriginal heritage; therefore, no mitigation measures related to impacts to non-Aboriginal heritage are required for the operation of the Proposal.

Table 8-53 Summary of non-Aboriginal heritage mitigation measures

ID	Environmental safeguards	Timing
NA-01	Prior to their on-site involvement, all personnel engaged for tree clearing and topsoil stripping would undergo a general site induction prior to their on-site involvement that provides information on legal obligations with respect to archaeological relics, including 'stop-work' conditions applicable in the event that any identified or suspected heritage relics are discovered at any time.	Pre-construction
NA-02	In the event that any identified or suspected historical relics are detected at any time, all disturbance work should immediately cease within 20m of the find and temporary protective fencing erected around this 'no-go zone' pending further management advice from the OEH (Planning and Aboriginal Heritage Section, North Coast Region). If the find consists of or includes human remains, the NSW Police Department and NSW Coroner's office would be contacted.	Pre-construction / construction / operation

8.12 Visual amenity

This chapter presents an assessment of the impacts of the Proposal on visual amenity in relation to the requirements outlined in the SEARs. Table 8-54 provides a summary of the relevant SEARs, which relate to visual amenity and where these have been addressed in this EIS.

Table 8-54 SEARs relevant to visual amenity

SEAR	Where addressed in EIS?
Visual impacts	Section 8.12

8.12.1 Existing environment

The Proposal Site is located within the Cairncross WMF, approximately two kilometres west of the Pacific Highway. Telegraph Point is five kilometres to the north-east. The Hatch is to the east, Redbank to the south, and Cairncross State Forest to the west.

The regional terrain is typical of the Mid North Coast, visually characterised by the elevated and steep topography of Mount Cairncross and Morton Creek to the west, and the coastal dune system to the east. The Proposal Site is located at the top of a shallow valley feature extending south from a low east-west ridge passing along the northern part of the site.

The Wilson and Maria River floodplains to the east of the site form an extensive area of relatively flat, swampy land. These floodplains are primarily used for agriculture with a rural landscape consisting of generally flat terrain with farm dams, intermittent creeks and drainage lines.

West of the Cairncross WMF is Cairncross State Forest. The land formation is sloping to the west where it peaks at Mount Cairncross with an elevation of 536 metres. The forest represents a unique natural landscape characterised by tall open forest woodland. The final landform profile maintains a similar profile to the surrounding landscape and is lower than the surrounding tree top canopy ensuring the landfill continues to be screened. As such, the Proposal Site would not be visible from outside the Cairncross WMF site boundaries. The nearest sensitive receivers (shown in Figure 8-1) are residential properties located approximately 1.3 kilometres to the north-east and more than 0.8 kilometres to the south-west of the Proposal Site.

Since commencement of operation of the site as a landfill in 2000 PMHC have not received any complaints from the community, including the closest residential receivers, in relation to operation of the landfill and no non-compliances have been recorded against operational performance requirements. The broader community acceptance of the landfill (see further detail in Section 4) and compliance with environmental performance requirements indicates that the siting of the landfill is suitable, providing an adequate buffer from all sensitive environmental receivers.

8.12.2 Assessment of impacts

The landscape of Cairncross WMF will be progressively altered during the construction and operation of the Proposal. There would be no visual impacts to sensitive receivers as topography and vegetation blocks views between the Proposal Site and sensitive receivers. Ridgelines to the north-east and south-west of the Proposal Site block views to sensitive receivers. In addition, a Koala Connectivity Corridor, Rawdon Creek Nature Reserve, and biodiversity corridor border the southern, eastern and western sides of the Proposal Site, respectively, and will provide consistent future vegetation screening. The Proposal Site would only be visible from Cairncross WMF. As such, the Proposal will have no visual impact on sensitive receivers

8.12.3 **Mitigation measures**

As identified above, no visual impacts are expected to result from the Proposal as topography and vegetation blocks views between the Proposal Site and sensitive receivers. Therefore, no mitigation measures are required.

8.13 Hazards and risk

This section presents an assessment of the impacts of the Proposal in relation to hazards and risk as required by the SEARs. Table 8-55 provides a summary of the relevant SEARs, which relate to hazards and risk and where these have been addressed in this EIS.

Table 8-55 SEARs relevant to hazards and risk

SEAR	Where addressed in EIS?
Hazards and risk	Section 8.13

The Proposal has the potential to pose environmental, human health, and amenity hazards if it were to operate without any measures to reduce or minimise its impact in the locality. As such, the Proposal falls within the definition of a “potentially hazardous industry” or “potentially offensive industry” under SEPP 33.

A hazard is any thing or situation with a potential for causing damage to people, property or the biophysical environment. Hazard identification was undertaken based on a review of the Proposal in the context of the Proposal Site and surrounding area. In identifying hazards, operational and organisational safeguards designed to prevent or mitigate the effects of hazardous incidents have also been taken into consideration.

In addition to addressing the SEARs, this section has been prepared to address SEPP 33 which requires an assessment of hazards and risks. The hazard and risk assessment included completion of a screening test in accordance with *Applying SEPP 33* (DPI, 2011) to determine whether a PHA is required. This involved:

- Identification of dangerous goods involved in the Proposal, the quantities of these goods and the distance of the storage location relative to the Proposal Site boundary
- Determination of whether the Proposal would emit a polluting discharge which would cause a significant level of offense, and hence require a licence.

8.13.1 Existing environment

The Proposal Site is located within the existing Cairncross WMF and includes the existing (Stage E) operational landfill area.

Bushfire-prone land has been mapped by Council, pursuant to provisions of section 146 of the EP&A Act. The Proposal Site has been assessed as containing Category 1 Bushfire Prone Vegetation. An extract of the PMHC Bushfire Prone Land Map is provided in Figure 8-25. A *Bushfire Risk Management Plan* has been prepared by PMHC pursuant to Section 52 of the *Rural Fires Act 1997*, wherein the Cairncross WMF has been assessed as having a medium risk level as there is potential for harm to humans and infrastructure from bushfires.

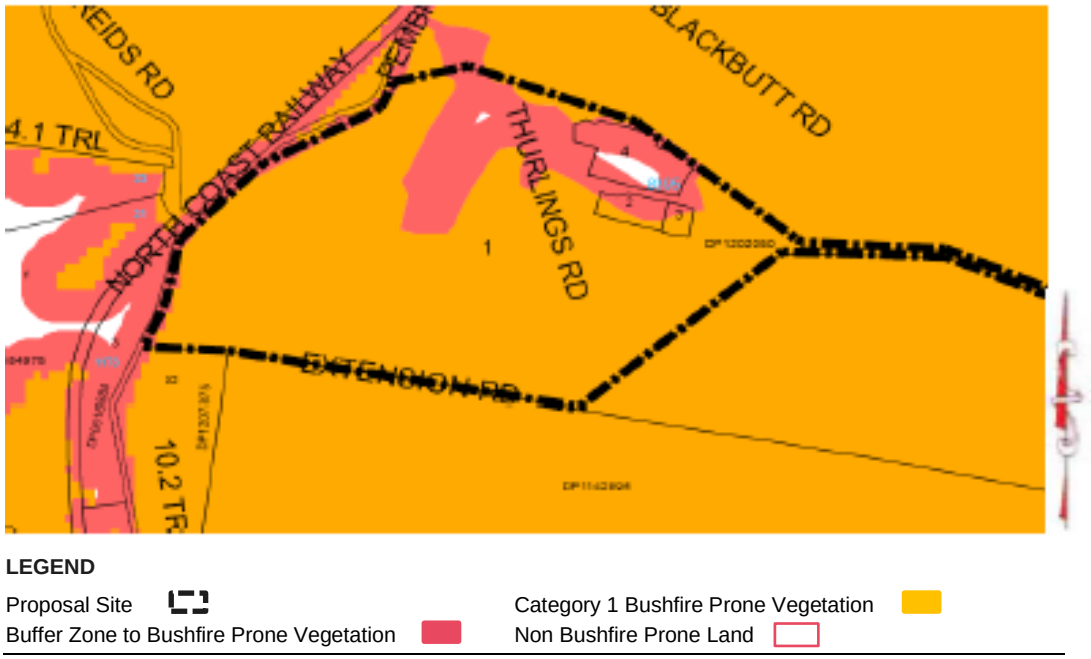


Figure 8-25 Extract of the PMHC Bushfire Prone Land Map

8.13.2 **Assessment of impacts**

Risk screening

As described in *Applying SEPP 33* (DoP, 2011) the first stage of determining the SEPP 33 procedural requirements, and in particular to determine if a PHA is required, is to undertake screening tests, such as dangerous goods quantity / distance thresholds.

Hazardous materials are substances falling within the classification of the *Australian Code for Transportation of Dangerous Goods by Road and Rail* Edition 7.5 (Dangerous Goods Code) (NTC Australia, 2017). The only hazardous material likely to be accepted and stored onsite is asbestos, which does not fall within the classification of the Dangerous Goods Code. All other hazardous materials, including fuel for site vehicles, will be stored in the existing storage facilities in the Cairncross WMF and would be managed in accordance with the 2008 OEMP. As such, a PHA would not be required for the Proposal.

All asbestos waste on the existing WMF is regulated under EPL 11189 from the EPA. The EPL prescribes a limit of 100,000 t/pa of asbestos allowed to be received onsite. As mentioned above, the worst-case scenario year to date for the existing landfill, was in 2011 with 1,444 tonnes of asbestos accepted to site. This is well below the required EPL threshold and demonstrates that the WMF complies with the prescribed activity and limit.

Other potential hazards and risks are discussed below, however with the application of the mitigation measures outlined in Section 8.13.3, the Proposal is considered to have minimal potential for impacts to human and environmental health. The risk screening therefore concludes that a PHA is not required.

Other hazards and risks

Fire and explosion

Fire and explosion have the potential to cause human injury and damage to property and equipment. Fire may be caused by a number of factors including: bushfires

encroaching onto the site (more information below), fires in waste entering the Proposal Site caused by burning material brought in with waste, or fire initiated onsite (e.g. from a vehicle accident, inappropriate management of hot works, equipment or vandalism). Explosion may result from methane accumulation and ignition, or fires reaching the gas generator and gas flare infrastructure.

Bushfire

A bushfire assessment was conducted by Australian Bushfire Protection Planners (ABPP) who classified the Proposal Site as a high bushfire risk. The adjoining forest vegetation has potential to produce high intensity fires that could develop into crown fires. Bushfires would impact upon the Proposal Site by producing levels of radiant heat which may cause injury to workers and ignite exposed waste and equipment. Burning embers blown onsite may result in ignition of combustible materials, including exposed waste in the landfill cells.

Spills

Liquid and solid spills may arise from situations such as potential loss of putrescible loads. Depending on the material and circumstances, spills mays result in damage to skin and airways, as well as physical impact and injury. Spills also have potential to cause harm to the environment, particularly if liquid spills of toxic and hazardous substances enter waterways or groundwater and / or contaminate soil.

Health and respiratory impacts

Potential emissions from the Proposal Site include vehicle exhaust, dust, microbial or gases / odours. These airborne emissions have the potential to cause health impacts, such as asthma and allergies, in the local community. Mitigation measures relating to health and respiratory impacts are addressed in Section 8.6.3.

Vehicle movements

Heavy vehicles, private vehicles and pedestrian (staff and public) movements on the Proposal Site present potential hazards in terms of incidents between vehicles, between vehicles and pedestrians and vehicles and property. Mitigation measures relating to traffic and vehicle movements are addressed in Section 8.8.3

Hazardous material

Asbestos would continue to be received at the Proposal Site as allowed under the current EPL. Private vehicles disposing of asbestos containing material will be directed to the designated asbestos area. Risks associated with the disposal of asbestos include human health (respiratory) risks and vehicle safety when accessing the landfill site. Mitigation measures relating to asbestos are included in Table 8-56.

Other than small household quantities of asbestos, hazardous materials would be identified by the weighbridge operators and would be refused entry to the Proposal Site. The person delivering the material would be required to dispose of the waste elsewhere at an appropriately licensed facility at their own cost. Any hazardous material that is unintentionally accepted/identified within the Proposal Site has the potential to cause harm to the environment and/or result in human health impacts. Mitigation measures relating to management of hazardous waste materials are addressed in Section 8.13.3.

Mitigation measures have been identified for key hazards and risks and are included in Table 8-56.

8.13.3 **Mitigation measures**

Table 8-56 identifies safeguards and management measures that will be implemented to address potential hazards and risks associated with the Proposal. Safeguards and management measures are recommended in line with the relevant objectives and principles set out in the 1999 EIS and the Cairncross OEMP (PMHC, 2008).

Table 8-56 Hazards and risk mitigation measures

ID	Mitigation measures	Timing
HR-01	Operational procedures for responses to fire would be included in the update to the 2008 OEMP in accordance with: • AS 3745 - 2010 *Planning for emergencies in facilities* • AS 1815 *Maintenance of Fire Suppression System and Equipment* • AS 2419.1-2005 Fire hydrant installations - System design, installation and commissioning.	Operation
HR-02	The existing Cairncross WMF emergency response plan will be updated to include the Proposal Site	Construction / operation
HR-03	The following safe operating procedures would be adopted: • Clear signage and road markings (speed limits, give way signs, directions, no access areas and disposal areas) • Limited number of heavy vehicles to be onsite at any one time • Ensure all personnel operating vehicles on site are licenced and competent • Inspection of trucks entering facility to ensure any hazardous waste is identified prior to entering the site • Excavator operators will receive training	Construction / operation
HR-04	Defendable Spaces would be maintained by regular slashing to limit vegetation (grass) height to 150 mm during the Bushfire Danger Period.	Operation
HR-05	The Strategic Fire Advantage Zone adjacent to the adjoining nature reserve would be provided and maintained along the boundary. This zone would be managed in accordance with the prescriptions provided by the NSW Rural Fire Service's 'Environmental Assessment Code 2006'.	Construction / operation
HR-06	The forest vegetation retained within each landfill stage, being the residual vegetation beyond the operating cell, would be fuel managed by hazard reduction burning in accordance with the prescriptions provided by the NSW Rural Fire Service's 'Environmental Assessment Code 2006'. Management of the combustible fuels would be undertaken to maintain a Low – Moderate Overall Fuel Hazard, pursuant to the DSE Overall Fuel Hazard Guide.	Construction / operation
HR-07	The Landfill plant and equipment such as Water Tankers and heavy earth moving plant would be maintained on 'stand-by' readiness during days of Total Fire Ban status.	Construction / operation
HR-08	Work practices would be established in recognition of the likely risk of ignition of the vegetation on the adjoining land by the operation of machinery such as slashers etc. These would include	Construction / operation

ID	Mitigation measures	Timing
	the provision of portable fire extinguishers during maintenance activities that involve cutting, grinding, welding and slashing etc.	
HR-09	To mitigate the risk of ignition of the surrounding vegetation, contractors undertaking drilling, cutting, grinding, welding and slashing operations on the site would not undertake such works without the provision of a portable fire extinguisher.	Construction / operation
HR-10	For the purpose of fuel reduction from hazard reduction burning, the following should be part of the ongoing management: • All perimeter trails clear and maintained; • Internal trails maintained to allow for mosaic burning; • Asset Protection Zones/Defendable Spaces to be constructed and maintained around infrastructure; • Provide and maintain temporary fire trails, Asset Protection Zones/Defendable Spaces adjacent to each stage.	Construction / operation

9 OTHER ENVIRONMENTAL ISSUES

9.1 Socio-economic

While not listed as a key issue in the SEARs, socio-economic considerations are a key component of environmental assessment, as required under the EP&A Act and EP&A Reg and therefore have been addressed below. This section presents an assessment of the Proposal in relation to socio-economic impacts.

9.1.1 Existing environment

The Proposal Site is located in the PMHC LGA within the mid north coast of NSW, approximately 320 kilometres north of Sydney.

Surrounding land uses

The Proposal Site is located within the Pembrooke precinct (ABS, 2011) and is a rural area largely comprised of forestry and primary production within the PMHC LGA. The nearest residential properties to the Proposal site are located approximately 1.3 kilometres to the north-east and more than 0.8 kilometres to the south-west of the Proposal Site. Cairncross State Forest borders the Proposal Site to the north and south, with the Rawdon Creek Nature Reserve located to the south-east. The western edge of the Proposal Site is bordered by land zoned for infrastructure which contains a compensatory habitat area that was established as part of the Cairncross WMF. To the west of the compensatory habitat area is Pembrooke Road, beyond which is agricultural land zoned for primary production. Further description of the surrounding land uses is provided in Section 2.1.

Population and growth

PMHC LGA has experienced moderate growth between the 2006 and 2011 population census, with an increase of 1.06 percent. The resident population from the 2011 census was 72,697 for the LGA.

Analysis of the age structure of the PMHC LGA in 2011 compared to NSW shows PMHC has a relatively older population than the NSW average with a higher percentage of the population aged 55 to 64 years, with a significantly higher percentage over 65 years. The median age is significantly higher than NSW at 48 years of age compared to the NSW average of 37 years.

Table 9-1 Age summary of PMHC LGA (Australian Bureau of Statistics (ABS), 2011)

Characteristic	PMHC LGA		Regional NSW average	
	No. of persons	% of persons	No. of persons	% of persons
Infants (0-4)	3,523	5	458,736	6.6
Children (5-14)	7,954	12	873,776	12.6
Young adults (15-24)	3,843	10	893,101	12.9
Adults (25-54)	21,878	33	2,865,574	41.5
Mature adults (55-64)	9,542	14	810,290	11.7
Aged (65+)	17,024	26	1,018,180	14.7

Characteristic	PMHC LGA		Regional NSW average	
	No. of persons	% of persons	No. of persons	% of persons
Total	66,307	100	6,917,658	100

Characteristic	PMHC LGA	Regional NSW
Median age of persons	48	37

Employment

Employment data from the ABS 2011 Census is provided in Table 9-2. Data shows that employment rates vary for the majority of the PMHC LGA compared to the NSW average, with full time employment being lower than the NSW average and part time employment being higher than the NSW average. Unemployment levels in PMHC LGA are slightly higher than the NSW average.

Table 9-2 Employment summary for PMHC LGA (ABS 2011 Census)

Employment status	PMHC LGA		Regional NSW average	
	No. of persons	% of persons	No. of persons	% of persons
Full time	13,765	53.7	2,007,924	60.2
Part time	9,365	36.5	939,465	28.2
Away from work	1,522	5.9	190,944	5.7
Unemployed total	1,904	7.2	196,525	5.9
Total in labour force	26,556	100	3,334,858	100

Income

Personal income data for PMHC LGA provided in Table 9-3 and Table 9-4 demonstrate that approximately 59 percent of the population earn less than $600 per week. Weekly income data is slightly negatively skewed with few people earning greater than $1,300 per week. Table 9-4 demonstrates that income in the area is generally lower than that of the NSW average. Median family and median household income in the PMHC LGA is significantly lower than the NSW average, median individual income is only slightly lower than the NSW average.

Table 9-3 Weekly personal income for PMHC LGA

Weekly income	Number of persons	Percentage
Negative/Nil income	2,971	5.4
$1-$149	4,033	7.4
$150-$249	8,417	15.4
$250-$399	8,075	14.7
$400-$599	8,682	15.8
$600-$799	6,033	11
$800-$999	3,845	7

Weekly income	Number of persons	Percentage
$1,000-$1,299	3,002	5.5
$1,300-$1,599	1,941	3.5
$1,600-$1,999	2,333	4.3
$2,000 or more	1,572	2.9
Individual income not stated	3,924	7.2
Total	54,828	100

Table 9-4 Personal income data for PMHC LGA

Income	PMHC LGA	NSW
Median individual income ($/week)	445	561
Median family income ($/week)	996	1,477
Median household income ($/week)	827	1,237

9.1.2 Assessment of impacts

An assessment of the impacts of the Proposal are provided in Table 9-5. Overall, the Proposal will result in a number of positive impacts on the social and economic fabric of the immediate surrounds and the PMHC LGA. The Proposal will provide the local community with ongoing access to a landfill that has proven usability, efficiency, safety and environmental performance.

Table 9-5 Socio-economic impacts

Impact	Comment	Stage	Type/Timeframe
Economic			
Application cost savings	Gaining approval for all three stages (rather than submitting separate applications in future for each additional stage) would save time and expense in reapplying for planning approvals as additional landfill space is required.	Application	Direct, positive short term impact
Employment	The Proposal will result in the generation of eight temporary jobs during construction in addition to the existing five permanent staff that would continue to be required on-site to manage the landfill operations including: • Weighbridge attendant x 2 • Landfill supervisor x 1 • Machinery operator x 2.	Construction and operation	Direct, positive, short and long term impact.
Future economic implications	Construction of the Proposal would increase the landfill capacity by 36 years to cater for the predicted increase in population and waste	Operation	Direct, positive, long term impact.

Impact	Comment	Stage	Type/Timeframe
	generation. Without the Proposal, waste would need to be transported to waste facilities outside of the PMHC LGA.		
Cost-effective waste service	The Proposal will extend the capacity of the Cairncross WMF thus prolonging the cost-effective waste service it provides to the community.	Operation	Direct, positive, long term impact.
Social			
Environmental performance	A review of waste management performance would be undertaken prior to the construction of each new stage. This would improve the overall environmental performance of the facility and have positive impacts on the surrounding environment. Furthermore, as discussed in Section 8.12 of this EIS, the Proposal includes a number of key mitigation measures, all of which would be implemented during both the construction and operational phases to ensure that there is minimal adverse impact on the surrounding natural environment and public amenity.	Construction and operation	Direct, positive, short and long term impact.
Compliance with social and economic policies	As discussed in Section 3, the Proposal is consistent with, and supports, state, regional and local planning (social and economic) policies. The Proposal has given considerable attention to ensuring that it achieves the goals of these strategies and, in particular, supports the anticipated population growth within the PMHC LGA.	Operation	Direct, positive, short and long term impact.
Traffic management and generation	As discussed in Section 8.8, the traffic generated from the Proposal is not expected to impact on the performance of the associated road network.	Construction / Operation	Neutral impact.

Overall, the Proposal would have a positive impact on the socio-economic environment within the PMHC LGA by securing future landfill capacity to service the PMHC LGA, providing ongoing employment opportunities, supporting the Waste Strategy and improving the environmental performance of PMHC's waste management solutions.

9.1.3 Mitigation measures

Section 9.3 includes a range of mitigation measures which would ensure that the Proposal does not adversely impact on the surrounding social and economic context. The existing OEMP details the Complaints Register in place for the Cairncross WMF used to register and manage complaints and feedback received to ensure that any concerns raised by the public are promptly and effectively addressed.

9.2 Ecologically sustainable development

As required under the SEARs and the EP&A Regulation (Schedule 2, Clause 7), the following section outlines how the Proposal is consistent with the principles of ESD.

9.2.1 Existing environment

Ecologically sustainable development

The Commonwealth Government refers to ESD as 'using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future can be increased' (Commonwealth Department of the Environment, 1992).

In NSW, the commitment to the concept of environmental sustainability is expressed in current legislation. It is an object of the EP&A Act (section 5((a) vii) to encourage ESD through the implementation of the four principles of ESD. The four principles of ESD are defined in clause 7(4) of Schedule 2 of the EP&A Regulation as being:

Precautionary principle, namely, that if there are threats of serious or irreversible environmental damage, lack of scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, public and private decisions should be guided by:

- Careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment
- An assessment of the risk-weighted consequences of various options

Inter-generational equality, namely, that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations

Conservation of biological and ecological integrity, namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration

Improved valuation, pricing and incentive mechanisms, namely, that environmental factors should be included in the valuation of assets and services, such as:

- Polluter pays, that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement;
- The users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste; and
- Environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.

9.2.2 Assessment of impacts

Precautionary principle

The precautionary principle requires evaluation of the risks of serious or irreversible environmental damage associated with a proposed development. The Proposal has been designed in order to reduce the risk of serious and permanent impacts on the environment.

Specialist studies were undertaken to provide accurate information to assist with the evaluation and development of the Proposal, including: traffic; air quality and odour; noise and vibration; visual amenity; greenhouse gas; flora and fauna; and Aboriginal and non-Aboriginal heritage. Where a level of uncertainty was identified in the data used for the assessments, a conservative worst-case scenario analysis was undertaken. These specialist studies did not identify any issues that may cause serious and irreversible environmental damage as a result of the Proposal, assuming the mitigation measures identified in Section 9.3 are appropriately applied. Table 9-6 at the end of this section outlines all the key potential impacts.

A precautionary principle approach has been applied where data used in the assessments has been unclear or uncertain. A conservative worst-case scenario has been adopted when designing solutions for the Proposal.

Inter-generational equity

Inter-generational equity is concerned with ensuring the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations.

The Proposal has been designed to benefit both existing and future generations through the provision of a high quality landfill which, combined with PMHCs other waste minimisation and resource recovery initiatives, will be sufficient to service the Port Macquarie-Hastings LGA until 2056. In the absence of providing a well-cited, constructed and operated landfill, the cumulative effects of waste build-up would significantly reduce local environmental values and amenity which would in turn affect future generations.

While the Proposal has some potential impacts, as outlined at the end of this section in Table 9-6, they are assessed as being minor and are considered unlikely to disadvantage future generations. Mitigation measures have also been identified which would ensure there are no significant adverse environmental impacts associated with the Proposal.

The development of landfill extension at Cairncross was identified in the Waste Strategy as having the potential to service the surrounding communities and assist in meeting the NSW WARR Targets for 2021 – 22. This will, in turn, result in ongoing employment opportunities at the Proposal Site for five full-time equivalent staff.

In addition, the Proposal would be constructed and operated according to high environmental standards, outlined in the OEMP, to avoid or minimise any adverse environmental impacts. Continuous improvements in the OEMP would occur to ensure that best practice methods are being employed wherever reasonable and feasible.

Conservation of biological diversity and ecological integrity

The assessment found that 3.4 hectares of native vegetation mapped as Blackbutt Grassy Forest would be cleared as part of the Proposal. This vegetation forms habitat for a number of threatened fauna species, including Koala, Green-thighed Frog and a number of threatened microbats, all of which were recorded on or adjacent to the site. As such, it is likely that the Proposal would result in impacts to threatened fauna species and habitat listed under the TSC Act and/or EPBC Act.

The area of native vegetation to be cleared (3.4 hectares) is relatively small in comparison to larger areas of native vegetation in the adjoining nature reserve and state forest. The Proposal includes establishment and management of an approximately 50 metre wide Koala connectivity corridor along the southern edge of Stage 2 of the Proposal Site. The Koala connectivity corridor will be managed to encourage use by native species, specifically Koalas, as well as other species likely to impacted by the Proposal including Green-thighed Frog and a number of threatened microbats.

Impacts to threatened fauna species habitat as a result of the Proposal would be offset in accordance with the requirements of the NSW Biodiversity Offsets Policy for Major Projects.

The biodiversity assessment and proposed mitigation measures have been outlined in Section 8.2

Improved valuation, pricing and incentive mechanisms

This principle requires that costs to the environment are incorporated or internalised in terms of the overall project costs, ensuring that decision making takes into account the environmental impacts.

While it is often difficult to place a reliable monetary value on the residual, environmental and social effects of the Proposal, the value placed on environmental resources within and around the Proposal is evident in the extent of environmental investigations, planning and design of impact mitigation measures undertaken to inform assessments and to minimise, if not prevent, adverse environmental impacts.

This EIS has examined the environmental consequences of the Proposal and identifies mitigation measures for areas where adverse environmental impacts may occur. The implementation of mitigation measures represents a capital and or operational cost for the Proposal, acting as a valuation in economic terms of environmental resources.

Summary of impacts

Potential impacts to ecologically sustainable development are outlined in Table 9-6.

Table 9-6 Potential impacts to ESD

Aspects	Impacts
Flora and fauna	- Loss of 3.4 hectares of native vegetation of the PCT Blackbutt - Pink Bloodwood shrubby open forest of the coastal lowlands of the NSW North Coast Bioregion which provides habitat including terrestrial fauna habitat (including habitat for threatened and migratory species) - Habitat fragmentation/ loss of fauna habitat connectivity

Aspects	Impacts
	- Impacts to GDEs - Potential fauna mortality, edge effects, weed invasion, alteration to air quality and noise levels that may affect fauna species and indirect impacts.
Soil	Earthmoving activities exposing the soil and increasing risk of erosion and sedimentation. Potential generation of significant volumes of leachate which presents a high risk of contamination if not properly managed.
Water	Surface water: - Changes to local hydrology have been minimised through sediment basin design - Site water balance found that a water deficit is considered unlikely to occur except in extreme drought conditions, which would be mitigated by the ability to draw water from storage basins - Potential water quality impacts are considered unlikely provided the relevant mitigation measures are implemented effectively. Groundwater: - Groundwater inflows are expected to occur at a very low rate (0.015 L/s), nonetheless the predicted groundwater interception will need to be licenced, and volumes purchased on the market, in accordance with the Water Sharing Plan. - No impact to groundwater is predicted to occur at any of the identified groundwater user bores.
Leachate	A core element of the Proposal is the leachate management strategy. If not managed appropriately, leachate has the potential to migrate outside of the lined landfill cell and result in soil, surface and groundwater contamination. Potential leachate impacts to soil, surface and groundwater are considered unlikely provided the Proposal is implemented in accordance with the design outlined herein.
Air quality	Odour and dust generated from the Proposal are predicted to comply with the impact assessment criteria at all sensitive receptors.
Noise and vibration	- Operational noise levels associated with the Proposal are predicted to comply with the

Aspects	Impacts
	established criteria during the proposed hours of operation at all nearby receivers - Road noise levels are predicted to exceed the RNP assessment criteria at the most potentially affected receivers in the year of opening and closing. However, the increase in road noise levels due to the Proposal is less than 2db therefore no mitigation of traffic noise levels is warranted.
Traffic	- The total number of two-way trips during the week is predicted to increase by 12 percent in 2020 and almost fourfold by 2056, in comparison to the current year. The total number of two-way trips during the weekend is predicted to increase by 11 percent in 2020 and by 67 percent by 2056, in comparison to the current year. - Relatively small increase in the number of trips at Blackmans Point Road interchange of four percent in the year 2020 and nine percent in the year 2056 - The increase in vehicle movements is offset by the significant reduction in through-traffic associated with the realignment of the Pacific Highway and the site intersection is predicted to operate at LoS A. . - Pre-existing safety risk of occasional vehicles cutting the corner when making right-hand turns out of the Cairncross WMF Access Road.
GHG	GHG emissions from the Proposal will peak in the year 2057 at approximately 126,000 tonnes
Aboriginal heritage	Two Aboriginal heritage sites within the Proposal Site with a low level of archaeological potential would be destroyed
Hazard and risk	- Fire and explosion caused by a number of factors including encroachment of bushfire, fires in waste, methane accumulation and ignition, or fires reaching the gas generator and gas flare infrastructure - The Proposal Site has been assessed has having a high bushfire risk - Liquid and solid spills may arise from situations such as potential loss of putrescible loads - Health and respiratory impacts from vehicle exhaust, dust, microbial or gases/odours, and asbestos

Aspects	Impacts
	- Safety of pedestrians and drivers at risk from vehicle movements on site

9.2.3 Mitigation measures

As identified above the ESD related impacts are associated with the environmental aspects discussed in earlier chapters of this EIS (see Section 8). The relevant mitigation measures are summarised in Section 10.

9.3 Cumulative impacts

There are no current or planned future developments within the surrounding area that would result in significant adverse cumulative impacts in combination with the Proposal. As such, it is unlikely the Proposal will cumulatively impact on the biophysical environment. Notwithstanding this, the mitigation measures recommended throughout the EIS would minimise the impacts associated with the Proposal and reduce the potential for cumulative impacts.

10 COMPILATION OF MITIGATION MEASURES

The EIS for the Proposal has identified a range of environmental impacts and recommended management and mitigation measures to avoid, remedy or mitigate these impacts (see Section 8). Table 10-1 provides a compilation of the mitigation measures.

This Section presents a summary of the measures that PMHC is committed to implementing either prior to construction, during construction or during operation. These draft mitigation measures may be revised in response to public submissions to the EIS and/or design changes. The final Compilation of Mitigation Measures will form part of a post submissions response to PMHC. It is envisaged that these mitigation measures will form the basis for Conditions of Approval which would be provided for the Proposal, subject to successful approval.

The draft Compilation Mitigations Measures for the Proposal is provided in Table 10-1. In some instances, greater detail as to how those measures would be implemented is provided in Sections 8 and 9.

Table 10-1 Draft compilation of mitigation measures

#	Measure	Timing
Flora and Fauna		
FF-01	Clearing of vegetation and excavation activities would not be undertaken during overland flow events (where there is surface runoff present after rainfall and prior to entering a waterway).	Construction / operation
FF-02	Stabilisation of disturbed areas adjacent to retained native vegetation, including revegetation where appropriate, would be undertaken as soon as feasible and reasonable after disturbance.	Construction / operation
FF-03	A biobanking agreement would be established to secure an offset site Under the NSW Biodiversity Offsets Policy for Major Projects prior to clearing the 3.4 ha of native vegetation within the Stage 3 area. The offsets site would secure the ecosystem and species credit offset requirements outlined in Section 8.2.3. All offset land will be funded and managed in perpetuity under Councils Public Bushland Management Programme. Management actions would include, but not be limited to, the following: • Identification of type and location of weeds of concern within the site • Identification of sensitive receivers (such as native vegetation and waterways) within or adjacent to the Proposal Site • Management and disposal of weeds (including declared noxious weeds) in accordance with requirements of the *Noxious Weeds Act 1993*.	Pre-construction / construction / operation Note: the offset site would need to be established prior to clearing the 3.4 ha of native vegetation within the Stage 3 area.
FF-04	Fauna microhabitat, such as logs, would be removed from areas to be cleared and relocated to suitable nearby habitat.	Pre-construction / construction

#	Measure	Timing
FF-05	Extent of clearing would be fenced with highly visible temporary fencing to ensure that clearing does not extend beyond the area necessary.	Pre-construction / construction
FF-06	A hollow replacement program would be implemented in the Koala corridor and on any proposed offset site. Hollows would be replaced at 1:1 ratio to offset the impacts to one small hollow, 10 medium hollows and five large hollows.	Pre-construction / construction
FF-07	All injured fauna to be reported to the site manager. Contact details would be kept on site for the local animal rescue group (Fawna Wildlife Rescue, Port Macquarie) and veterinarian if any fauna are injured on site or require capture and/or relocation.	Pre-construction / construction / operation
FF-08	A two-stage clearing process will be implemented in areas of the Proposal site containing hollow-bearing trees. An experienced ecologist would be present on site to supervise all stages of removal of hollow bearing trees, as well as relocation of any fauna.	Pre-construction / construction / operation
FF-09	If feasible and reasonable, vegetation clearing should not be undertaken during the breeding seasons for threatened fauna species with potential habitat on the Development Site. This will not be possible for all identified threatened species as breeding seasons collectively span a large portion of the year. In order of preference of avoidance, the breeding periods are: - Koala – September to February (breeding season) - Glossy Black Cockatoo – March to August (breeding season) - Spotted-tail Quoll – June to January (maternal den season) - Grey-headed Flying Fox – October to March (breeding season) - Southern Myotis – November to February (breeding season) Scheduling the vegetation removal for Autumn months would generally avoid the breeding season of most species that could occur on site.	Pre-construction / construction
FF-10	The Koala connectivity corridor will be managed in perpetuity and rezoned for environmental protection with the next standard LEP instrument amendment by Council.	Construction / operation
Soil		
S-01	A detailed ESCP would be developed, to cover both construction and operation of the Proposal, in accordance with the Blue Book, including: – Installation of erosion and sediment controls prior to construction commencing – Separation of clean and dirty water	Pre-construction, construction and operation

#	Measure	Timing
	– Minimisation of ground disturbance and areas of exposed soils, where possible – Stabilisation and revegetation of exposed soils as soon as practicable – Avoidance/minimisation of clearing and earthworks during periods of heavy rain – Measures to reduce the velocity and erodibility of surface water flows across the site – Measures for management of stockpiles and sediment basins – Requirements for classification of surplus excavated materials under the NSW EPA *Waste Classification Guidelines 2014*.	
Water		
W-01	Measures to minimise the demand for water for dust generation would be implemented (e.g. minimising vehicle movements on unsealed roads and minimising excavation/earth moving during windy periods, where possible).	Construction / operation
W-02	A surface and groundwater monitoring program would be developed in accordance with requirements outlined in the Concept Design Report (Appendix B), the Hydrogeological Assessment (Appendix F) and the Guidelines.	Pre-construction / construction / operation
W-03	A groundwater assessment report would be prepared at least once every five years, or should the groundwater monitoring program detect a possible failure of the leachate containment system.	Pre-construction / construction / operation
Leachate		
L-01	Consideration of, and recommendations regarding, a leachate extraction and level-control system (including a collection sump and leachate risers) would be developed to facilitate extraction of leachate from each cell.	Pre-construction
L-02	A leachate monitoring program would be developed in accordance with the requirements outlined in the Concept Design Report (Appendix B) and Leachate Assessment (Appendix S)	Pre-construction / operation
Air quality and odour		
A-01	Procedures and training for staff would be developed to report the presence of strong odours around the perimeter of the Proposal Site	Operation

#	Measure	Timing
A-02	The active tipping face would be kept as small as practicable.	Pre-construction / construction / operation
A-03	Vehicles will be maintained and serviced according to the manufacturer's specifications and engines will be switched off when not in use	Construction / operation
A-04	All trucks entering and leaving the premises carrying loads must be covered at all times, except during loading and unloading	Construction / operation
A-05	Vehicles would be limited to a speed limit of 20 km/h	Construction / operation
A-06	Appropriate dust management practices would be maintained, including use of washing down as required and reducing drop heights from loading and handling equipment, where possible.	Construction / operation
A-07	The complaints management procedures currently in place at the Cairncross WMF would be continued for the future landfill stages, including maintenance of the existing Complaints Register.	Construction / operation
Noise and vibration		
N-01	Implement requirements for on-going maintenance of fixed and mobile plant in accordance with manufacturers specifications, ensuring silencers are fitted where reasonably practicable and considering replacing tonal reversing alarms with broadband devices on all site-owned plant.	Construction / operation
N-02	Awareness training would be provided for staff and contractors for managing environmental noise issues including: • Ensuring that vehicles don't queue at the site entrance prior to opening • Limiting unnecessary idling of plant • Minimising the use of horn signals and maintaining a low volume.	Pre-construction / construction / operation
Traffic		
T-01	Standard Operating Procedures (SOPs) to educate waste collection contractors/ heavy-vehicle drivers about appropriate exit procedures and avoidance of corner-cutting when exiting the Cairncross WMF Access Road would be developed	Operation
Greenhouse gas		
GHG-01	Project planning would be undertaken to ensure that on-site vehicle movements and construction activities	Pre-construction / construction / operation

#	Measure	Timing
	are efficient, avoid double handling of materials and avoid unnecessary fuel use.	
GHG-02	A landfill gas monitoring program would be undertaken for Stages 1 to 3	Pre-construction / construction / operation
GHG-03	A landfill gas management plan based on the findings of the 2017 landfill gas pumping trial would be developed. The extent of landfill gas controls to be designed and implemented for the existing and proposed stages of the landfill would be guided by the results of the gas pumping trial. If feasible, the implementation of a gas capture or flaring system will be considered.	Pre-construction / construction / operation
Aboriginal heritage		
AB-01	Prior to their on-site involvement, all personnel engaged for tree clearing and topsoil stripping would undergo a general site induction prior to their on-site involvement that provides information on legal obligations with respect to Aboriginal objects, including 'stop-work' conditions applicable in the event that any identified or suspected heritage objects are discovered at any time	Pre-construction / construction / operation
AB- 02	In the event that any identified or suspected Aboriginal objects are detected at any time, all disturbance work should immediately cease within 20m of the find and temporary protective fencing erected around this 'no-go zone 'pending further management advice from the OEH (Planning and Aboriginal Heritage Section, North Coast Region). If the find consists of or includes human remains, the NSW Police Department and NSW Coroner's office would be contacted. If the burial is identified as being of Aboriginal origin a heritage professional and NSW OEH would be contacted to determine the subsequent course of action.	Pre-construction / construction / operation
AB-03	PMHC would provide the OEH AHIMS Registrar with Aboriginal Site Impact Recording Forms for sites CWD 3 and CWD 4 once these sites are affected by the Proposal.	Pre-construction / construction / operation
Non-Aboriginal heritage		
NA-01	Prior to their on-site involvement, all personnel engaged for tree clearing and topsoil stripping would undergo a general site induction prior to their on-site involvement that provides information on legal obligations with respect to archaeological relics, including 'stop-work' conditions applicable in the event that any identified or suspected heritage relics are discovered at any time.	Pre-construction
NA-02	In the event that any identified or suspected historical relics are detected at any time, all disturbance work should immediately cease within 20m of the find and temporary protective fencing erected around this 'no-go zone 'pending further management advice from the OEH (Planning and Aboriginal Heritage Section, North	Pre-construction / construction / operation

#	Measure	Timing
	Coast Region). If the find consists of or includes human remains, the NSW Police Department and NSW Coroner's office would be contacted.	
Hazards and risks		
HR-01	Operational procedures for responses to fire would be included in the update to the 2008 OEMP in accordance with: • AS 3745 - 2010 *Planning for emergencies in facilities* • AS 1815 *Maintenance of Fire Suppression System and Equipment* • AS 2419.1-2005 *Fire hydrant installations - System design, installation and commissioning.*	Operation
HR-02	The existing Cairncross WMF emergency response plan will be updated to include the Proposal Site	Construction / operation
HR-03	The following safe operating procedures would be adopted: • Clear signage and road markings (speed limits, give way signs, directions, no access areas and disposal areas) • Limited number of heavy vehicles to be onsite at any one time • Ensure all personnel operating vehicles on site are licenced and competent • Inspection of trucks entering facility to ensure any hazardous waste is identified prior to entering the site • Excavator operators will receive training	Construction / operation
HR-04	Defendable Spaces would be maintained by regular slashing to limit vegetation (grass) height to 150 mm during the Bushfire Danger Period.	Operation
HR-05	The Strategic Fire Advantage Zone adjacent to the adjoining nature reserve would be provided and maintained along the boundary. This zone would be managed in accordance with the prescriptions provided by the NSW Rural Fire Service's 'Environmental Assessment Code 2006'.	Construction / operation
HR-06	The forest vegetation retained within each landfill stage, being the residual vegetation beyond the operating cell, would be fuel managed by hazard reduction burning in accordance with the prescriptions provided by the NSW Rural Fire Service's 'Environmental Assessment Code 2006'. Management of the combustible fuels would be undertaken to maintain a Low – Moderate Overall Fuel Hazard, pursuant to the DSE Overall Fuel Hazard Guide.	Construction / operation

#	Measure	Timing
HR-07	The Landfill plant and equipment such as Water Tankers and heavy earth moving plant would be maintained on 'stand-by' readiness during days of Total Fire Ban status.	Construction / operation
HR-08	Work practices would be established in recognition of the likely risk of ignition of the vegetation on the adjoining land by the operation of machinery such as slashers etc. These would include the provision of portable fire extinguishers during maintenance activities that involve cutting, grinding, welding and slashing etc.	Construction / operation
HR-09	To mitigate the risk of ignition of the surrounding vegetation, contractors undertaking drilling, cutting, grinding, welding and slashing operations on the site would not undertake such works without the provision of a portable fire extinguisher.	Construction / operation
HR-10	For the purpose of fuel reduction from hazard reduction burning, the following should be part of the ongoing management: • All perimeter trails clear and maintained; • Internal trails maintained to allow for mosaic burning; • Asset Protection Zones/Defendable Spaces to be constructed and maintained around infrastructure; • Provide and maintain temporary fire trails, Asset Protection Zones/Defendable Spaces adjacent to each stage.	Construction / operation

11 SUMMARY AND CONCLUSION

PMHC (the Proponent) proposes to expand the Cairncross Landfill at the Cairncross WMF. PMHC is seeking development approval to extend the Cairncross Landfill to cover the remaining area identified for landfilling in the 1999 EIS[20].

The Proposal is for the expansion of the existing landfill at the Cairncross Waste Management Facility (Cairncross WMF), and would involve the progressive construction, operation and rehabilitation of three landfill stages (Stages 1-3), following a staged approach with implementation over approximately 36 years. Stage 1 would commence construction/operation in approximately 2019/2020 respectively and Stage 3 would reach capacity in approximately 2056 with a landfill closure period to follow. Despite recent and expected future increases in diversion of waste to landfill, the annual waste acceptance rate would progressively increase over the life of the Proposal due to predicted population and waste generation growth per capita.

The Proposal will receive waste from all areas within the PMHC LGA including the major townships of Port Macquarie, Wauchope and Camden Haven. Waste will include general solid waste and asbestos from domestic and C&I sources

The key works for which approval is sought include:

- Progressive landfill cell construction, operation and rehabilitation of three landfill stages (Stages 1-3) including:
  - Clearing of existing vegetation
  - Construction of access tracks
  - Earthworks for cell formation including extraction and stockpiling of materials and the reapplication to form the leachate barrier as well as for daily, intermediate and final cover
  - Installation of leachate management structures including the leachate barrier, collection, storage and disposal system
  - Construction of a rising main to transfer leachate to the adjacent STP
  - Installation of a stormwater management system
  - Progressively increasing the annual waste acceptance rate at the landfill
  - Signage and other ancillary works
  - Rehabilitation of closed cells
- Delineation and ongoing management of an approximately 50 m wide Koala connectivity corridor around the south-western border of the site.

Environmental investigations were undertaken during the preparation of the EIS to assess the potential environmental impacts of the Proposal. These included specialist assessment and assessment for key environmental issues involving biodiversity, soil, surface water quality, leachate, groundwater, Aboriginal heritage, traffic, greenhouse gas and hazards and risks.

The EIS concludes that many of the potential impacts identified would be effectively managed through Proposal design features. To manage other impacts, and in some cases eliminate them completely, a number of mitigation and management measures would be implemented as outlined in Section 8.

[20] The 1999 EIS was prepared by ERM to support the development application, and subsequent approval, for the first stage of the Cairncross Landfill.

The EIS includes an assessment of the permissibility of the Proposal under relevant EPIs and legislation. The Proposal is permissible with consent and is 'state significant development' (SSD) under Part 4, Division 4.1 of the EP&A Act.

In conclusion the Proposal has been subject to an EIS in accordance with the EP&A Act and the SEARs. The Proposal satisfies the requirements of the SEARs and is consistent with the principles of ecologically sustainable development. The potential environmental, social and economic impacts, both direct and cumulative, have been identified and thoroughly assessed as part of this EIS. The assessment concluded that no significant environmental impacts have been identified as a result of the Proposal. It is considered that any potential impacts can be satisfactorily mitigated through a range of measures that have been identified within the EIS. In addition, the Proposal has been assessed against, and has been found to be consistent with, the priorities and targets adopted in relevant published and draft State plans, as well as Government policies and strategies.

The Proposal will provide significant benefit by providing additional landfill capacity required to meet the projected PMHC population and waste generation rates in an environmentally responsible way. Overall, the EIS concludes that the Proposal is in the public interest and approval is recommended.

REFERENCES

ABS (2011) 2011 Census Quick Stats. Commonwealth of Australia, ACT. http://www.censusdata.abs.gov.au/census_services/getproduct/census/2011/quickstat/SSC11857?opendocument&navpos=220

ANZECC and ARMCANZ (2000) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, Australian and New Zealand Environment and Conservation Council and the Agriculture and Resource Management Council of Australia and New Zealand.

Arcadis (2016) *Port Macquarie – Hastings Council Cairncross Landfill Expansion – Future disposal capacity requirements*. Prepared for Port Macquarie-Hastings Council.

Austroads (2010) *Guide to Road Design, Part 4A: Unsignalised and Signalised Intersections*, Austroads, Sydney http://www.rms.nsw.gov.au/business-industry/partners-suppliers/documents/austroads-supplements/roaddesign_part4a-agrd-unsignalised-and-signalised-intersections.pdf

Biolink (2013) *Vegetation of the Port Macquarie-Hastings Local Government Area.* Report to Port Macquarie Hastings Council. Dated April 2013.

Bureau of Meteorology (BOM) (2016) Atlas of Groundwater Dependent Ecosystems http://www.bom.gov.au/water/groundwater/gde/map.shtml

Bureau of Meteorology (BOM) (2017) Climate statistics for Australian locations – Port Macquarie Airport AWS http://www.bom.gov.au/climate/averages/tables/cw_060139.shtml

Commonwealth Department of the Environment (1992) *National Strategy for Ecologically Sustainable Development.* Commonwealth of Australia. http://www.environment.gov.au/about-us/esd/publications/national-esd-strategy

Commonwealth of Australia (2014) *EPBC Act Referral Guidelines for the vulnerable koala (combined populations of Queensland, New South Wales and the Australian Capital Territory).*

Collins (1998) *Proposed Cairncross waste depot, NSW mid-north coast: Aboriginal archaeological assessment.* Prepared for Hastings Council.

Connell Wagner (2001) *Cairncross Waste Management Facility Landfill Environment Management Plan (2001),* Sydney, NSW

CSIRO (2017) Australian Soils Information System, accessed 16 March 2017, www.asris.csiro.au

Darkheart Eco-Consultancy (2013) *Statutory Ecological Impact Assessment: Proposed Industrial Waste Precinct, Cairncross Waste Management Facility, Cairncross State Forest.*

DECC (2008) *Managing Urban Stormwater: Soils and Construction Volume 2B Waste Landfills (the Blue Book).* DECC NSW and Sydney Metropolitan Catchment Management Authority, NSW. http://www.environment.nsw.gov.au/resources/stormwater/08188soilsconststorm2b.pdf

DECCW (2010) *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010. Sydney South: DECCW.*

DIPNR (2004) *Authorisation for timber plantation*, Department of Infrastructure, Planning and Natural Resources, Sydney, NSW

DPE (2011) *Hazardous and Offensive Development Application Guidelines - Applying SEPP 33,* NSW Government, NSW. http://www.planning.nsw.gov.au/Policy-and-Legislation/~/media/3609822D91344221BA542D764921CFC6.ashx

DPE (2016) *Draft North Coast Regional Plan,* NSW Government, NSW.

Department of the Environment (DoE) (2014a) National Greenhouse and Energy Reporting (NGER) System Measurement, Technical Guidelines for the estimation of greenhouse gas emissions by facilities, Commonwealth of Australia, Canberra

DoE (2014b), Technical Guidelines for the Estimation of Greenhouse Gas Emissions by Facilities in Australia: National Greenhouse and Energy Reporting (Measurement) Determination 2008, Commonwealth of Australia 2014

DoE (2016a) National Greenhouse Accounts (NGA) Factors, Commonwealth of Australia, Canberra ACT

DoE (2016b), State and Territory Greenhouse Gas Inventories 2014: Australia's National Greenhouse Accounts, Commonwealth of Australia

DoE (2016c), 'National Greenhouse Gas Inventory – Kyoto Protocol Accounting Framework', Australian Government, <accessed May 2016>, <accessed from http://ageis.climatechange.gov.au/#>

World Resources Institute/World Business Council for Sustainable Development (2004), Greenhouse Gas Protocol The Greenhouse Gas Protocol – A Corporate Accounting and Reporting Standard Revised Edition

ERM Mitchell McCotter (1999) *Cairncross Waste Management Facility Environmental Impact Statement*. Prepared for Hastings Council.

Eco Logical Australia (2005) *A Vegetation Map for the Northern Rivers Catchment Management Authority to support application of the Biodiversity Forecasting Toolkit.* Report prepared for Northern Rivers CMA. Dated December 2005.

Milledge D.R. (1998) *Cairncross Waste Depot Species Impact Statement.* Prepared for Hastings Council by Landmark Ecological Services Pty Ltd.

MRA (2016) *Draft Port Macquarie-Hastings Council Waste Strategy: 2015-2024*. Prepared for Port Macquarie – Hastings Council.

Northern Rivers Catchment Management Authority (2012) *Report Card 2012: Aquatic ecosystem health check for the Hastings Catchment*, NSW Government, NSW.

NSW Department of Natural Resources, Australian Government Department of Transport and Regional Services and PMHC (2006) *Hastings River Flood Study*, NSW.

NSW Department of Primary Industries – Water (2016) *Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources*, NSW Government, NSW.

NSW EPA (2000) *Environmental Guidelines: Use and Disposal of Biosolids Products*, NSW EPA, Sydney.

NSW EPA (2014) *NSW Waste Avoidance and Resource Recovery Strategy 2014-21*, NSW Government, NSW.

NSW EPA (2014) *Waste Classification Guidelines 2014*, accessed 1 February 2016, http://www.epa.nsw.gov.au/wasteregulation/classify-guidelines.htm

NSW EPA (2015) *New Requirements for Weighbridges*, NSW EPA, Sydney, NSW, accessed online, 8 February 2017, http://www.epa.nsw.gov.au/resources/wasteregulation/150109-weighbridges-new-requirements-factsheet.pdf

NSW EPA (2016) *Environmental Guidelines: Solid Waste Landfills (Second edition),* NSW Government, NSW.

NSW EPA (2017a) *NSW Contaminated Land Public Record*, accessed 16 March 2017, http://www.epa.nsw.gov.au/prclmapp/searchregister.aspx

NSW EPA (2017b) *List of NSW Contaminated Sites Notified to EPA as of 6 March 2017*, accessed 16 march 2017, http://www.epa.nsw.gov.au/clm/publiclist.htm

NSW Government (2013) *NSW 2021: A Plan to Make NSW Number 1*, NSW Government, NSW.

NTC Australia (2017) *Australian Code for Transportation of Dangerous Goods by Road and Rail* Edition 7.5, Commonwealth of Australia, Melbourne. https://www.ntc.gov.au/Media/Reports/(91D53582-C568-8B4A-6C7C-E746D36C65FD).pdf

OEH (2010) Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales, October 2010, Sydney, NSW

OEH (2013a) *Land and Soil Capability Dataset*, NSW Office of Environment and Heritage, electronic GIS dataset

OEH (2013b) Guidelines for developments adjoining land managed by the Office of Environment, accessed 15 February 2017, http://www.environment.nsw.gov.au/resources/protectedareas/development-land-adjoining-130122.pdf

OEH (2014) *Framework for Biodiversity Assessment.* Office of Environment and Heritage, September 2014

Pacific Environment Limited (2016) *Cairncross Landfill Leachate Generation Modelling*, Prepared for Port Macquarie Hastings Council.

Patterson Britton and Partners (1994) *Hastings Regional Waste Disposal Facility Site Selection Study*, NSW

Phillips, S. and Callaghan, J. (2011) *The Spot Assessment Technique: a tool for determining localised levels of habitat use by Koalas* Phascolarctos cinereus. Australian Zoologist 35(3): 774-780

PMHC (2008) *Operational Environmental Management Plan: Cairncross Waste Management Facility*, Port Macquarie Hastings Council, Port Macquarie, NSW.

PMHC (2013), *Solid Waste Management - Operational Policies, Standard Operating Procedures and Safe Work Method Statements,* PMHC, NSW.

PMHC (2017) *Cairncross Waste Management Facility: Concept Design Report,* PMHC, NSW.

PMHC (2017) *PMHC Waste and Resource Management Strategy 2017-2024*, PMHC, NSW.

Trace (2016) Hydrogeological Assessment, Cairncross Landfill Expansion, Prepared for Port Macquarie – Hastings Council.

Victorian EPA (2015) Best Practice Environmental Management, Publication 788.3 (August 2015), Melbourne, Victoria

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