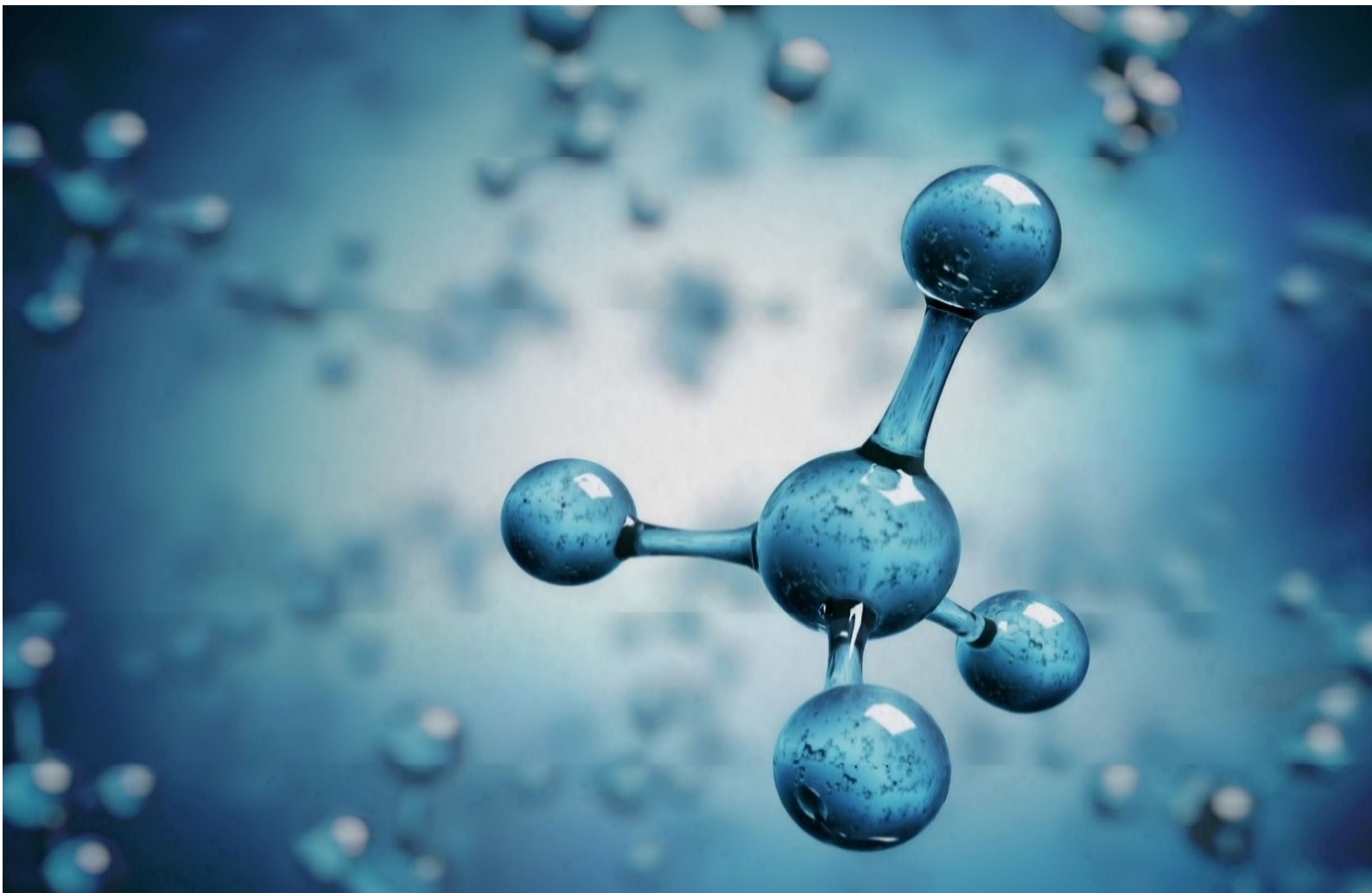
Lucas Heights Bioenergy Facility

Water Impact Assessment

LMS Energy Pty Ltd

October 2025

→ **The Power of Commitment**



Project name		Lucas Heights Bioenergy Facility					
Document title		Lucas Heights Bioenergy Facility | Water Impact Assessment					
Project number		1264988212649882					
File name		12649882-REP-Water Impact Assessment.docx					
Status Code	**Revision**	**Author**	**Reviewer**		**Approved for issue**		
			Name	**Signature**	**Name**	**Signature**	**Date**
S4	0	L Briggs	T Darley	Thomas Darley	K Rosen	On file	20/10/25

GHD Pty Ltd | ABN 39 008 488 373
Contact: Tom Darley, Senior Water Resource Engineer | GHD
133 Castlereagh Street, Level 15
Sydney, New South Wales 2000, Australia
T +61 2 9239 7100 | **F** +61 2 9239 7199 | **E** sydmail@ghd.com | **ghd.com**

Executive summary

The project

LMS Energy Pty Ltd (LMS) ('the proponent') is seeking approval to provide an upgrade to the landfill biogas management infrastructure at the Lucas Heights Resource Recovery Park (LHRRP) through the installation of a replacement bioenergy facility ('the project'). The project is located within the Sutherland Shire Local Government Area (LGA).

The project would involve a like-for-like replacement of the existing power station to comply with current standards and regulations. It would provide renewable energy generation via landfill biogas for the duration of remaining landfilling and the post-closure period for the site, which would last several decades. The proposed bioenergy facility would be capable of generating up to 190,000 MWh annually, which is equivalent to powering approximately 30,000 homes. The project would further support the transition to renewable energy while increasing supply to the National Energy Market.

The project is a State Significant Development and is subject to approval by the NSW Minister for Planning and Public Spaces under the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act).

This report

This water impact assessment report has been prepared on behalf of LMS to support the environmental impact statement (EIS) for the project (SSD-79933225) and responds to the Secretary's Environmental Assessment Requirements (SEARs) for soils and water management. In particular, this report addresses surface water management and construction phase erosion and sediment control.

The report outlines the existing environmental factors influencing surface water management and erosion and sediment control, as well as assessment methodologies undertaken to analyse riparian management, water quality, water sourcing, and erosion and sediment control practices during operation and construction. The assessment informed and assessed soil and water management measures in-built to the project as well as specifying mitigation measures where residual risk exists.

This report is subject to, and must be read in conjunction with, the limitations set out in section 1.4 and the assumptions and qualifications contained throughout the report.

Existing environment

The topography is variable due to waste emplacement at the Lucas Heights Resource Recovery Park (LHRRP) and existing access tracks east of the existing power station. There are two watercourses in the vicinity of the project site: Bardens Creek to the north-east, and Mill Creek to the north. Bardens Creek is an ephemeral second order watercourse as per the Strahler stream ordering system and is a tributary of Mill Creek. Mill Creek is an ephemeral first order watercourse directly north of the project site but is a perennial third order watercourse by the time it meets Bardens Creek, 3.5 kilometres (km) downstream of the project site. Mill Creek is a tributary of the Georges River, which is a seventh order watercourse and an unregulated river within the Sydney basin.

Impacts from the project during construction

Minor risk of impacts associated with changes to water quality during the construction phase associated with erosion and sedimentation as well as the handling of hazardous materials were assessed. This risk may be exacerbated during times of wet weather.

Impacts from the project during operation

Potential minor impacts during operation of the project associated with changes to water quality arising from the development of additional impervious areas required for the project were assessed. Given no significant changes to land use were proposed, impacts are not anticipated and mitigation measures were not identified as being required. During operation, procedures should be documented to maintain relevant drainage infrastructure.

Mitigation and management measures

The recommended construction water quality mitigation measures include a Stormwater Management Plan and an Erosion and Sediment Control Plan (ESCP) in accordance with the NSW Blue Book, as well as documenting environmental procedures for the operation of the facility relevant to the handling of hazardous materials.

Operational phase mitigation measures include:

– Developing procedures to maintain drainage features at the site, including open channels, culverts, stormwater control infrastructure, and sediment control basins and outlets. These should be maintained in accordance with the manufacturer's specifications and kept free draining.
– Identifying methods to appropriately handle hazardous materials such that they can be contained within the site within appropriate bunding during the operational phase. Specified responses to a pollution incident should be documented in the form of a Pollution Incident Response Management Plan (PIRMP). This documentation applies for all spill events, including the unlikely event that hazardous materials are conveyed outside of the LMS site boundary.

Conclusion

With the implementation of the specified mitigation and management measures, the project is not anticipated to result in material impacts to water resources.

Key terms, acronyms and abbreviations

Terms and abbreviations	Definition
AHD	Australian Height Datum
AIP	Aquifer Interference Policy
ANSTO	Australian Nuclear Science and Technology Organisation
ANZECC	Australian and New Zealand Environment and Conservation Council Water Quality Guidelines
ANZG	Australian and New Zealand Guidelines for Fresh and Marine Water Quality
ARR	Australian Rainfall & Runoff
ARRT	Advanced Resource Recovery Technology
ASS	Acid Sulfate Soils
BOM	Bureau of Meteorology
CEMP	Construction Environmental Management Plan
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DCP	Development Control Plan
DECC	Department of Environment and Climate Change
DECCW	Department of Environment, Climate Change and Water
DGV	Default guideline value
DO	Dissolved Oxygen
DPE	Department of Planning and Environment
DPHI	Department of Planning, Housing and Infrastructure
DPIE	Department of Planning, Industry and Environment
EC	Electrical conductivity
EDL	Energy Developments Limited
EIS	Environmental Impact Statement
EPA	Environment Protection Authority
EP&A Act	*Environmental Planning and Assessment Act 1979 (*NSW)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)
ESCP	Erosion and Sediment Control Plan
EPL	Environmental Protection Licence
GDE	Groundwater Dependent Ecosystem
GO	Garden Organics
HEVAE	High Ecological Value Aquatic Ecosystem
LEP	Local Environmental Plan
LFG	Landfill gas
LGA	Local government area
LHRRP	Lucas Heights Resource Recovery Park
LOR	Limit of Reporting
MUSIC	Model for Urban Stormwater Improvement Conceptualisation

Terms and abbreviations	Definition
MW	Megawatt
MWh	Megawatt hours
NSW	New South Wales
NWQMS	National Water Quality Management Strategy
OEH	Office of Environment and Heritage
OEMP	Operational Environmental Management Plan
PCBs	Polychlorinated biphenyls
PIRMP	Pollution Incident Response Management Plan
POEO Act	*Protection of the Environment Operations Act 1997* (NSW)
POEO Clean Air Regulation	NSW Protection of the Environment Operations (Clean Air) Regulation 2022
SEARs	Secretary's Environmental Assessment Requirements
SEPP	State Environmental Planning Policy
SILO	Scientific Information for Landowners
SSD	State Significant Development
SWL	Standing Water Level
SMP	Stormwater Management Plan
The Blue Book	Managing Urban Stormwater, Soils and Construction, Volume 1 (Landcom, 2004)
TDS	Total Dissolved Solids
TOC	Total Organic Carbon
TPH	Total Petroleum Hydrocarbons
TSS	Total Suspended Solids
WAL	Water Access Licence
WIA	Water Impact Assessment
WM Act	Water Management Act 2000
WMP	Water Management Plan
WSP	Water Sharing Plan

Contents

Table index

Figure index

Appendices

1. Introduction

1.1 Project Overview

LMS Energy Pty Ltd (LMS) proposes to upgrade the landfill gas management infrastructure at the Lucas Heights Resource Recovery Park (LHRRP), by upgrading the existing power station (the project) to produce renewable energy from landfill gas generated at the LHRRP.

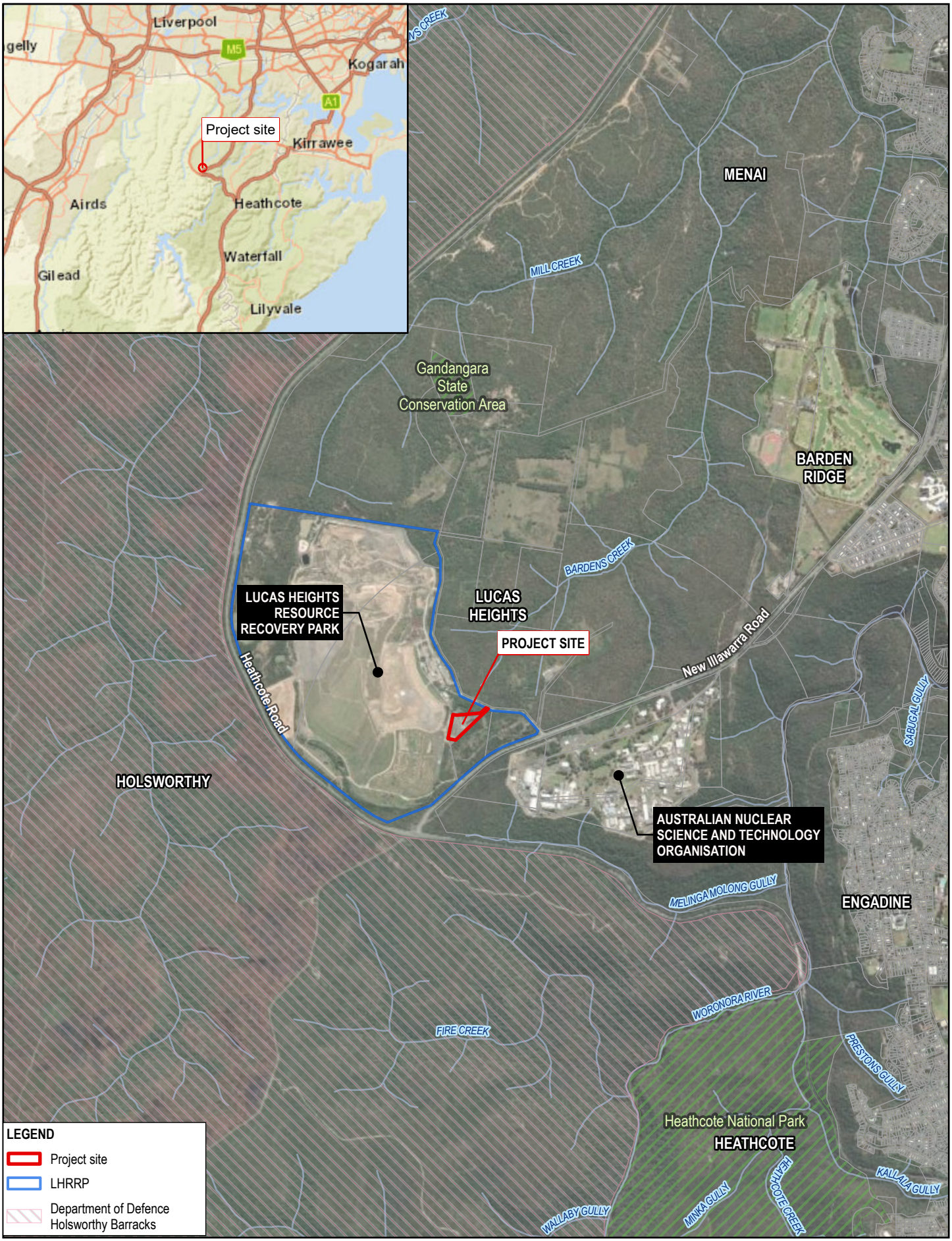
The new bioenergy facility would be a like for like replacement of the existing power station land fill gas generators within the existing power station site, with improvements that comply with modern standards and regulations and forecasted biogas generation capacity requirements. The project ensures appropriate capacity to manage forecast peak recoverable biogas and renewable energy generation would effectively continue through the remaining landfilling and post closure periods for the landfill.

1.1.1 Location

The project is located within the Sutherland Shire local government area (LGA), about 30 kilometres southwest of the Sydney central business district within the suburb of Lucas Heights. Lucas Heights sits between the Royal National Park, Heathcote National Park and the Cubbitch Barta National Estate Area, which is managed by the Department of Defence as a part of the Holsworthy Barracks.

The bioenergy facility would be located on Lot 102 DP 1009354 (existing power station site) which has an area of approximately 1.80 hectares.

The location of the project is shown on Figure 1.1.



Paper Size ISO A4

0 250 500 750 1,000

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

LMS Energy
Lucas Heights Bioenergy facility

Regional context

Project No. **12649882**
Revision No. **0**
Date **17/09/2025**

FIGURE 1.1

\\ghdnet\ghd\AU\Sydney\Projects\21\12649882\GIS\Maps\Deliverables\12649882_EIS.aprx
Print date: 17 Sep 2025 - 00:49

Data source: LPMA: DTDB/DCDB, 2019. World Imagery: Maxar
World Street Map: Esri, HERE, Garmin, NGA, USGS
Created by: dbbanatin

1.1.2 Key features

The key features of the project are summarised in Table 1.1.

Table 1.1 Key features of the project

Project element	Summary
Project site	1.8 ha site located within the existing power station footprint within the LHRRP.
Output capacity	20 x 1.1 MW modular lean burn generator sets to provide a total output of approximately 22 MW.
Proposed built infrastructure	**New proposed infrastructure** – Gas delivery and metering system – Transformers to step up the electrical output voltage from LV to HV to match the local grid voltage – Electricity metering, protection and communication equipment – Covered storage bund for chemical and coolant storage – HV Switchroom / Control room – Lightning poles – External lighting – Safety showers **Retained/ upgraded infrastructure** – Surface water drainage infrastructure – Gas delivery, metering and condensate removal system – Lunchroom / Toilet – Offices / Workshop – Car parking for on site operators – Security fencing – External lighting – Waste oil and clean oil tanks **Buildings to be decommissioned** – Workshop x 2 – Existing generators – Existing flare facility – Cooling towers.
Utilities connections	**Proposed new connections** – New underground HV electricity line to the Ausgrid 33 kilovolt (kV) distribution network as an extension of the connection from the existing on site electrical infrastructure to the Lucas Heights Zone Substation. **Existing utilities** – Fibre connection to the Lucas Heights Zone Substation – Potable water connection from LHRRP.
Hours of operation	– 6am–6pm for operational staff – Remote operation 24 hours per day, 7 days per week outside of operational hours.
Workforce	– 6 full time equivalent (FTE) staff during operation. – 15 FTE staff during construction

A detailed description of the project is provided in Chapter 3 of the EIS.

1.1.3 Construction

Construction of the project would commence in the first quarter of 2026 (Q1), with an estimated duration of 6 to 8 months (weather permitting and subject to planning approval). Construction activities would include:

Early works (site establishment)

– site compound set-up including fencing to isolate the construction area from existing power station operations and set-up of environmental controls
– decommissioning of existing site sheds and flare compound
– minor civil works for site levelling and compaction

Mobilisation and structure installations (project construction)

– generator assembly and placement onto concrete pads using cranes
– installation of gas delivery skids and placement onto concrete foundations
– ancillary connections (electricity through trenching) (gas, electrical, water, oil, compressed air)

Testing and commissioning

– test and commission of generators and ancillary equipment
– demobilisation.

1.1.4 Operations

Twenty 1.1 MW modular lean burn generator sets are proposed within the bioenergy facility.

The custom designed generator enclosures would be fully insulated to attenuate noise, with engine exhaust emitted through stainless steel stacks located on top of the modules, approximately 10.2 metres from ground level. Each generator module would house all the components required to operate as a stand-alone unit and are specially designed as fully enclosed bunded systems.

The modularised generator equipment is scalable, allowing flexibility to operate mixed modes (i.e. a combination of either flaring and / or generation) as required. This ensures the ability to combust the maximum available gas, 24 hours per day is seamless with programmable logic controls and remote monitoring ensuring continuous tracking.

1.1.5 Decommissioning of existing power station

LMS proposes to continue to operate the existing power station until the energisation of the bioenergy facility is completed which is currently forecast for Q4 2026. The new facility would incorporate many of the existing power stations fit for purpose facilities including the offices, gas delivery infrastructure, HV connection point and oil storage. The retention and reuse of existing infrastructure (where fit for use) provides an important waste minimisation strategy for the proposed development.

Decommissioning of the balance of the existing power station would commence following the commissioning and energisation of the new bioenergy facility and would broadly include:

– disconnection and isolation of electrical and gas infrastructure
– safe removal and recycling of redundant generator units and ancillary equipment
– dismantling of associated infrastructure not required for future use
– management and disposal of decommissioned materials in accordance with relevant environmental regulations and site waste management procedures
– repurposing of the vacated area, consistent with site-wide operational needs.

1.1.6 Post closure decommissioning

The proposed bioenergy facility is designed to remain operational even after landfilling activities are expected to cease at the LHRRP around 2037 to the early 2040s. Landfills continue to generate residual biogas for decades after closure, and the facility would play a critical role in capturing and utilising this biogas to minimise emissions and produce renewable energy. Operations would continue for as long as landfill biogas is available, with the facility expected to have a lifespan of 25 to 30 years.

Once the facility reaches the end of its operational life, the proponent would evaluate whether to reinvest in the project to extend its lifespan or proceed with decommissioning. This decision would be based on commercial and environmental factors, including the availability of landfill biogas and the feasibility of ongoing operations.

The modular design of the facility is such that individual generator modules can be progressively decommissioned, allowing continued operation of the facility in line with the rate of biogas production at the site over time.

1.2 Secretary's Environmental Assessment Requirements

The specific SEARs addressed in this report are summarised in Table 1.2.

Table 1.2 SEARs relevant to this assessment

Requirement	Where addressed in this report
Water Management	
A site water balance detailing the water demand, supply and measures to minimise water use and water licensing requirements	Section 6.5
A description of groundwater and surface water conditions and all works/activities that may intercept, extract, use, divert or receive surface water and/or groundwater (both temporary and permanent)	Sections 4.4, 1.1, 4.7 and 6
An assessment of potential surface and groundwater impacts (both quality and quantity), including potential impacts on watercourses, riparian areas, groundwater, and groundwater-dependent communities	Section 6
Details of the proposed stormwater/wastewater drainage design including the capacity of onsite detention system(s), onsite sewage management and measures to treat, reuse or dispose of water	Section 6.2.2
details of any surface or groundwater mitigation, management and monitoring activities and methodologies.	Section 7
Soils	
An assessment of potential impacts on soil resources and riparian land on and near the site, including:	Section 6.3, with reference made to the Contamination Preliminary Site Investigation (GHD, 2025b).
Impacts on soil erosion, salinity and acid sulfate soils	Section 6.1
Details of earthworks, including cut and fill volumes	Section 6.4.1
Description of the proposed erosion and sediment controls during construction.	Section 7.1

1.3 Purpose of this report

The purpose of this report is to assess impacts of the project on water resources. The report:

– Addresses the relevant SEARs
– Considers the relevant issues discussed in public authority responses to request for key issues
– Assesses potential impacts during all stages of the project (construction and operation)
– Recommends measures to mitigate and manage the potential impacts identified.

1.4 Scope and limitations

This report has been prepared by GHD for LMS Energy Pty Ltd and may only be used and relied on by LMS Energy Pty Ltd for the purpose agreed between GHD and LMS Energy Pty Ltd as set out in section 1.3 of this report. GHD otherwise disclaims responsibility to any person other than LMS Energy Pty Ltd arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible. The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

2. Assessment methodology

The methodology for the project comprised four key components:

– A review of relevant legislation, policy, and guidelines.
– Identification of the existing environmental baseline.
– Impact assessment based on the project.
– Specification of mitigation measures for identified impacts (if any), with residual risks assessed.

The activities involved in each of these components are described below.

2.1 Review of relevant legislation, policy and guidelines

A review of relevant legislation, policies, and guidelines was conducted to establish the regulatory context for the assessment. This included, but was not limited to, key statutory documents:

– Sutherland Shire Council Local Environmental Plan 2015
– *Environmental Planning and Assessment Act 1979* (EP&A Act)
– *Protection of the Environment Operations Act 1997* (POEO Act)
– *Water Management Act 2000* (WM Act)
– Managing Urban Stormwater: Soils and Construction (Landcom, 2004)
– NSW Flood Risk Management Manual (2023)
– Australian Rainfall and Runoff (2019, updated 2024).

These documents provided the regulatory framework for assessing water-related impacts, including flood risk and surface and groundwater quality. Further details of these documents and requirements relevant to the project are provided in Chapter 3.

2.2 Existing environment

A baseline assessment of existing environmental conditions was undertaken to characterise site-specific hydrology, water quality, and flood characteristics. This included:

– Hydrology and drainage: Reviewing regional and local watercourses, drainage patterns, and nearby waterbodies.
– Surface water quality: Reviewing existing water quality information as it relates to potential interactions of the Project with the surrounding environment.
– Groundwater: Evaluating groundwater conditions based on nearby monitoring bores, including depth, flow direction, and potential groundwater-dependent ecosystems.
– Flood risk assessment: Identifying existing flood behaviour, including review of regional position of the site and likelihood of inundation.

These and other baseline conditions are described in detail in Chapter 4.

2.3 Impact assessment

A structured impact assessment was conducted to evaluate potential effects on hydrology, flooding, surface water, and groundwater based on the project. This included:

– Hydrology and drainage: Assessing required changes to local drainage patterns.
– Surface water quality: Evaluating the impact of erosion, sedimentation, and stormwater discharge during both construction and operational phases.
– Groundwater: Identifying any potential impacts on groundwater quality and flow.
– Cumulative impacts: Reviewing potential interactions with other projects in the region to assess broader water-related implications.

This impact assessment is described in detail in Chapter 6.

2.4 Identification of mitigation measures

Where potential impacts were identified as part of the assessment, mitigation measures were recommended to manage potential impacts from the project relevant to water.

These mitigation measures are described in detail in Chapter 7.

3. Legislative and policy context

3.1 NSW legislation

3.1.1 Environmental Planning and Assessment Act 1979

The *Environmental Planning and Assessment Act 1979 (*EP&A Act) is the core legislation relating to planning and development activities in NSW and provides the statutory framework under which developments are assessed. The EP&A Act aims to encourage the proper management, development and conservation of resources, environmental protection and ecologically sustainable development. The project is deemed to be SSD (SSD-79933225) under the EP&A Act and is subject to the preparation of an EIS. As part of the project EIS, the SEARs issued for the project (refer to section 1.2) have identified the requirement to undertake this Water Impact Assessment (WIA).

3.1.2 Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations Act 1997* (POEO Act) is administered by the NSW Environment Protection Authority (EPA), which is an independent statutory authority and the primary environmental regulator for NSW. The objectives of the POEO Act are to protect, restore and enhance the quality of the environment. Some of the mechanisms that can be applied under the POEO Act to achieve these objectives include programs to reduce pollution at the source and monitoring and reporting on environmental quality. The POEO Act regulates and requires licensing for environmental protection, including for water pollution and water resource impacts.

Under the POEO Act, an Environment Protection Licence (EPL) is required for premises at which a 'scheduled activity' is conducted. Schedule 1 of the POEO Act lists activities that are scheduled activities for the purpose of the Act. Licence conditions relate to pollution prevention and monitoring and can control the air, noise, water and waste impacts of an activity. The following EPL relevant to the project is listed in Table 3.1.

Table 3.1 Summary of EPLs relevant to the project

Licence Number	Licensee	Scheduled Activity	Date Issued
6345	EDL LFG (NSW) Pty Ltd	– Electricity generation	28 September 2000

The existing power station is operated by EDL, and EPL 6345 applies to the generation of electrical power from landfill biogas from the LHRRP, allowing for up to 250 GWh annual generation capacity. EPL 6345 will be transferred to LMS to allow the continued operation of the existing power station during construction and commissioning.

An EPL will be required for the new bioenergy facility and ongoing liaison with the EPA is required to determine if the existing EPL will be modified to accommodate the new facility or the existing EPL will be surrendered and a new licence issued.

3.1.3 Water Management Act 2000

The aim of the *Water Management Act 2000* (WM Act) is to ensure that water resources are conserved and properly managed for sustainable use benefiting both present and future generations. It is also intended to provide formal means for the protection and enhancement of the environmental qualities of waterways and in-stream uses as well as to provide for protection of catchment conditions.

Water resources in NSW are managed via Water Sharing Plans (WSPs). Provisions outlined within WSPs exist to ensure water is provided to support the ecological processes and environmental needs of groundwater dependent ecosystems and waterways. WSPs also regulate how the water available for extraction is shared between the environment, basic landholder rights, town water supplies and commercial uses. Water Access Licenses (WALs) entitle licence holders to specify share components in the available water that may be sustainably extracted from a particular water source. The actual volume of water available to be extracted may vary, dependent on available

water determinations made under the WM Act. Available water determinations are made for each WAL category in each water source and are generally made at the start of a water year, although may be altered at any time.

The project is located within the Lower Georges River and Bunbury Curran Creek Water Source which is regulated by the WSP for the Greater Metropolitan Region Unregulated River Water Sources 2023. LMS Energy do not seek to obtain water from the surface water or groundwater as part of the project and instead propose using existing onsite water services.

Table 3.2 outlines the water sharing plans which are relevant to the project.

Table 3.2 Relevant water sharing plans

Relevant Water Sharing Plan	Source	Relevance to the project
Groundwater		
Greater Metropolitan Region Groundwater Sources 2023	Sydney Basin Central Groundwater Source	Underlies the project footprint
Surface Water		
Water Sharing Plan for the Greater Metropolitan Region Unregulated River Water Sources 2023	Lower Georges River and Bunbury Curran Creek Water Source	Surface water sharing plan governing the project footprint

Under the WM Act (Section 24HA, Clause 7), any representative Aboriginal/Torres Strait Islander bodies, registered native title bodies corporate and registered native title claimants in relation to the land or waters that will be affected by the proposed development must be notified of the project and be given an opportunity to comment on it. The South Coast People are registered as claimants for the project site and surrounding areas.

3.2 Policies and guidelines

3.2.1 Sutherland Shire Council Local Environmental Plan

Local Environmental Plans (LEPs) are the principal planning controls for local councils, summarising permissible land uses throughout the local government area (LGA). LEPs provide a statutory basis for flooding-related planning controls.

The existing flood condition of the site is discussed in Chapter 4. As the site is not located in a flood prone area according to the Flood Planning Map, and is located at the top of a catchment, the project is not expected to impact flood conditions.

3.2.2 Sutherland Shire Council Development Control Plans

Development Control Plans (DCPs) specify detailed planning and design guidelines to support the provisions in the LEP. DCPs are not applicable to SSD projects, however, provide a reference point for the expectations of water quality controls.

3.2.3 Risk-based Framework for Considering Waterway Health Outcomes in Strategic Land-use Planning Decisions

The Framework (OEH, 2017) was developed by the OEH and the EPA in direct response to increasing urban development and a lack of integrated management of urban development, waterway health, and the community's expectations of the state's waterways. The purpose of the document is to provide regulatory authorities guidance to manage the impact of land-use activities on the health of waterways in NSW. The Framework is intended to be applied at a catchment or sub-catchment scale. The basis of the Framework is the NSW Water Quality and River Flow Objectives. The Framework is incorporated within this WIA through the use of the NSW Water Quality and River Flow Objectives (refer to section 3.2.4), effects based assessment and potential impacts on the relevant watercourses (refer to section 4.4 and section 6.1).

3.2.4 NSW Government Water Quality and River Flow Objectives

The NSW Water Quality and River Flow Objectives (DECCW, 2006) are the agreed environmental values and long-term goals for each catchment in NSW. The objectives are intended to be considered in assessing and managing the potential impacts of activities on waterways.

The project is located within the Georges River catchment. The NSW Water Quality and River Flow Objectives relevant to the project are described in section 4.1.

3.2.5 Australian and New Zealand water quality guidelines

The *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC, 2000 and ANZG, 2018) are the benchmark documents of the NWQMS which provide a guide for assessing and managing ambient water quality in a wide range of water resource types and according to specified environmental values, such as aquatic ecosystems, primary industries, recreation and drinking water. The ANZECC (2000) guidelines present numerical guidelines which can be used as a basis to assess the impact of the Project against defined objectives or values for the receiving waters. The Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG, 2018) provide guidance for assessing and managing ambient water quality according to specified environmental values, published following scientific review of the ANZECC (2000) guidelines. The Water Quality Management Framework (ANZG, 2018) provides the key requirements for determining appropriate guideline values or performance criteria to evaluate the results of water quality monitoring programs. The application of ANZG (2018) and ANZECC (2000) in the NSW Water Quality is discussed in section 1.1.

National Water Quality Management Strategy Guidelines for Groundwater Quality Protection in Australia (Department of Agriculture and Water Resources, 2013) provide guidance on risk-based management of groundwater quality within a national framework. This framework is based upon the Australian Drinking Water Guidelines (NHMRC & NRMMC, 2011). The guidelines also provide context on current and future groundwater quality issues and outline key elements to account for when developing a groundwater protection plan. These guidelines are discussed in section 6.4.

3.2.6 NSW Flood Risk Management Manual 2023 and NSW Flood Prone Land Policy

The NSW Flood Risk Management Manual 2023 and NSW Flood Prone Land policy provide for the management of flood-prone land within NSW. The manual “promotes the use of a merit approach which balances social, economic, environmental and flood risk parameters to determine whether particular development or use of the floodplain is appropriate and sustainable”. The NSW Flood Risk Management Manual 2023 is supported by several compendium guidelines. These guidelines are provided in relation to the management of flood liable lands, including any development that has the potential to influence flooding, particularly in relation to increasing the flood risk to people and infrastructure. If a project had the potential to increase flood risk through, for example, increasing stormwater runoff would be subject to consideration under the Floodplain Development Manual.

Flood risk and flood prone land in accordance with these policies is discussed in in section 4.8.

3.2.7 Australian Rainfall and Runoff

Australian Rainfall and Runoff (ARR) (Babister et al. 2019) is a national guideline document, data (including design rainfalls and other hydrologic data) and software suite that is used for the estimation of design flood characteristics in Australia. The approaches presented in ARR 2019 are essential for policy decisions and projects including infrastructure, town planning, mining, development of rural and urban floodplain management plans, operation of river systems, and estimation of extreme flood levels.

The project is not located in a flood prone area according to the Sutherland Shire LEP, and as a result a flood assessment was not required according to the SEARs. This is discussed in section 4.8.

3.2.8 Managing Urban Stormwater – Soils and Construction

Managing Urban Stormwater, Soils and Construction, Volume 1 (Landcom, 2004) more commonly referred to as 'The Blue Book' provides guidance and performance standards with relation to the control of erosion and sediment. Throughout NSW the performance standards of Landcom (2004) are commonly used to assess the suitability of proposed controls and residual risk and are commonly included by the EPA in relevant regulatory requirements. The guidelines are supported by the NSW Environment Protection Authority (EPA), as well as throughout other NSW government agencies, local government and industry.

The guidelines are referenced and implemented through the development of recommended mitigation measures for soil and water management for the Project, as described in Chapter 7.

3.2.9 Guidelines for controlled activity approvals

Section 91 of the WM Act details the requirements for obtaining a controlled activity approval to permit work to be carried out on waterfront land. This includes the bed of any river, lake or estuary and any land within 40 m of its highest bank. SSDs do not require controlled activity approvals, by virtue of Section 4.41 of the EP&A Act. However, it remains an offence to harm waterfront land beyond any conditions of consent.

The former NSW DPE has published a number of guidelines on types of controlled activities and the protection of waterfront land. The guidelines provide recommendations for the design and construction of instream works and an indication of the width of riparian zones to be considered. Whilst the SEARs request an assessment of impacts on riparian areas, as described in section 6.3, the Project does not propose to undertake works within 40 m of a waterway that would trigger the controlled activities guidelines.

3.2.10 NSW Aquifer Interference Policy 2012

The *NSW Aquifer Interference Policy* (NSW AIP) (DPI, 2012) outlines the water licensing requirements under the *Water Act 1912* and WM Act. A water licence is required whether water is taken for consumptive use or whether it is taken incidentally by the aquifer interference activity (such as dewatering) even where that water is not being used consumptively as part of the activity's operation.

Under the WM Act, a Water Access Licence (WAL) gives its holder a share of the total entitlement available for extraction from the groundwater source. The WAL(s) held by the person undertaking the extraction must cover a sufficient share component and water allocation to account for the take of water from the relevant water source at all times. Sufficient access licences must be held to account for all water taken from a groundwater or surface water source as a result of an aquifer interference activity, both for the life of the activity and after the activity has ceased.

The NSW AIP requires that potential impacts on groundwater sources, including users and GDEs, be assessed against Minimal Impact Considerations, outlined in Table 1 of the policy. If the predicted impacts meet the Level 1 Minimal Impact Considerations, then these impacts will be considered as acceptable. The adopted Level 1 Minimal Impact Considerations for the project are discussed in section 6.4.

3.2.11 Cumulative Impact Assessment Guidelines for State Significant Projects

The Guidelines (DPIE 2022a) were developed for strategic assessment and management of cumulative impacts, as facilitated by the ecologically sustainable development objectives of the EP&A Act. The guidelines aim to strengthen project-level Cumulative Impact Assessment (CIA) for State Significant Projects in NSW. CIA types include Issue-specific CIA, where the cumulative impacts of the project on key matters are assessed with other relevant future projects and Combined CIA, where the combined effect of the different cumulative impacts of the project on key matters, sensitive receptors or important features are considered with other relevant future projects. Relevant future projects may be identified via the NSW Major Projects website. The assessment should consider:

– The government's strategic planning framework for the area, having regard to any relevant legislation, plans, policies or guidelines.
– The project and other potentially relevant future projects that may be developed over the same time period or similar timeframes as the project.

– Potential material impacts on features including National Parks and other protected areas, environmentally sensitive areas, threatened species and ecological communities, important natural resources, culturally significant resources, key infrastructure and industries, sensitive land use zones, population centres, settlements and residential areas (key matters).
– The likely scale and nature of the cumulative impacts of these projects.

A cumulative impact assessment has been undertaken for the project and is discussed in section 6.6.

4. Existing environment

4.1 Regional context

The project site is located in the south-west of Sydney in NSW, within the Georges River catchment, shown on Figure 4.1**.** The Georges River catchment covers an area of 1,890 square kilometres (DPIE, 2025). The major population centres in the surrounding catchment are Sydney, Campbelltown, Parramatta, Liverpool and Camden. Water use in the Georges River catchment supports a range of users, including local councils, Sydney Water, tourism and heavy industry.

Elevations within the catchment range from approximately 250 m Australian Height Datum (AHD) in the Royal National Park near Woronora Dam to near sea-level at the wetlands and saltmarshes at the mouth of Georges River at Towra Point. Elevations near Lucas Heights in the vicinity of the project site are approximately 140 to 150 m AHD.

The catchment consists of major weirs and storages, uncontrolled streams, waterways affected by urban development and estuaries. The major tributaries of the Georges River are Bunbury Curran Creek, Cabramatta Creek, Prospect Creek, Harris and Williams Creeks, Salt Pan Creek and the Woronora River (SES, 2024).

Major water storages within the catchment include Woronora Dam, which regulates the Woronora River which is a tributary of the Georges River. Woronora Dam is approximately 7.2 km south-west of the project site. Woronora Dam supplies potable water to southern Sydney and parts of northern Wollongong and is the sole water supply to Lucas Heights. Woronora Dam has a capacity of 71,790 mega litres (ML). The other major water storage in Georges River Catchment is Prospect Reservoir, which is approximately 24 km north-west of the project site. Prospect Reservoir supplies potable water to much of Sydney, and has a total capacity of 50,200 ML.

The Ramsar listed Towra Point Aquatic Reserve is located downstream at the mouth of the Georges River, along the southern shore of Botany Bay including the Kurnell Peninsula. Towra Point Aquatic Reserve was listed as a Wetland of International Importance in 1984 and covers an area of approximately 140 hectares.

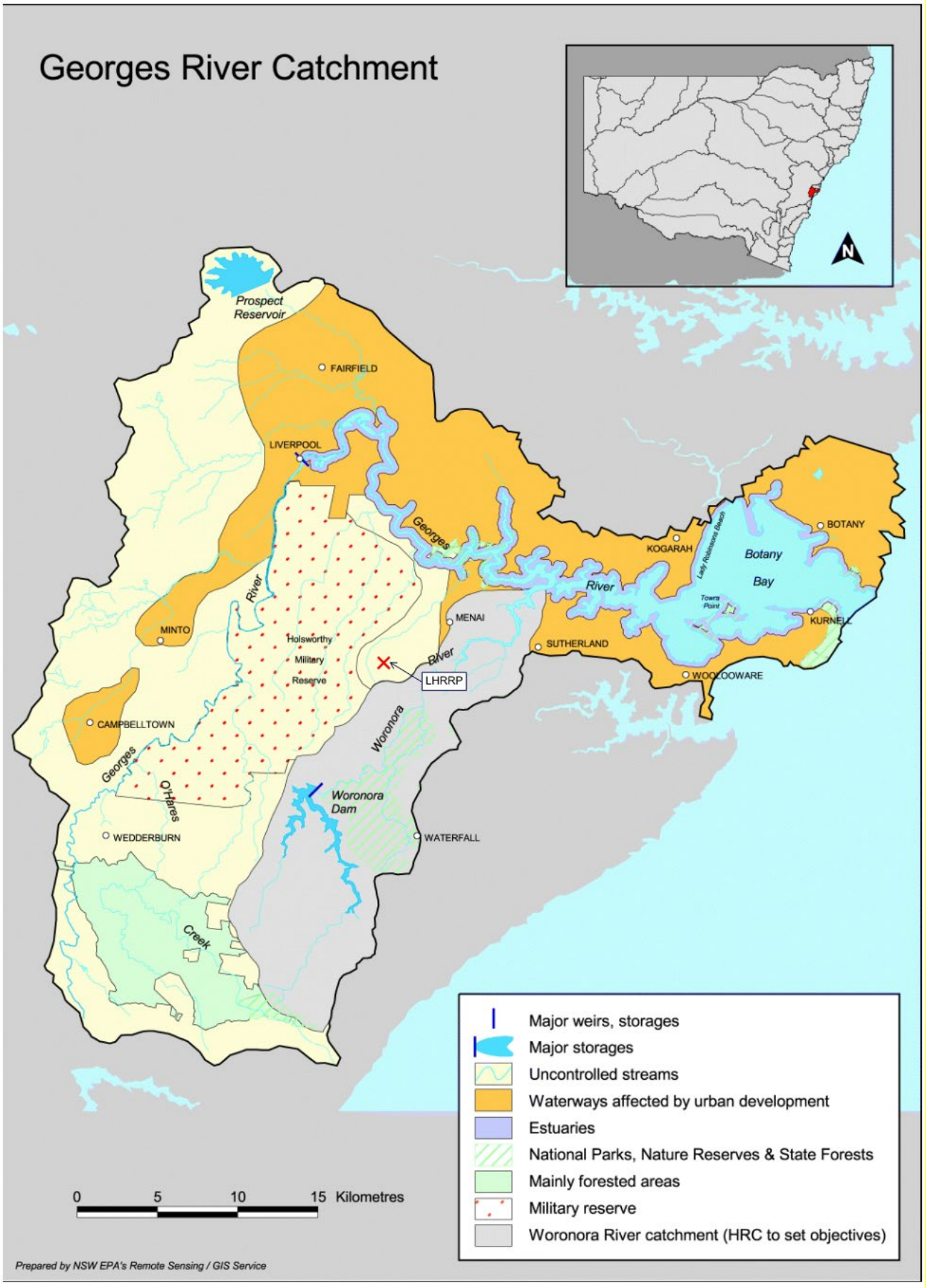


Figure 4.1 Georges River Catchment map with approximate project location marked in red (NSW DCCEEW 2024)

The project site is located within the Mill Creek catchment; an uncontrolled stream located in the south of the Georges River Catchment. The water quality and river flow objectives relevant to the project site (uncontrolled streams) are listed in Table 4.1 and Table 4.2 respectively. Any water access licences and works approvals held for the project would be subject to the rules of the relevant water sharing plan.

The water quality objectives are consistent with the national framework for assessing water quality provided by Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG, 2018) and have been considered in the assessment of impacts to existing surface water quality (discussed in section 4.5). The river flow objectives have been considered in the assessment of hydrology and drainage as discussed in section 6.1.

Table 4.1 NSW Water Quality Objectives (uncontrolled streams)

Water quality objective	Detail
Aquatic ecosystems	Maintaining or improving the ecological condition of waterbodies and their riparian zones over the long term.
Visual amenity	The objective applies to all waters, particularly those used for aquatic recreation and where scenic qualities are important.
Secondary contact recreation	Maintaining or improving water quality for activities such as boating and wading, where there is a low probability of water being swallowed.
Primary contact recreation	Maintaining or improving water quality for activities such as swimming in which there is a high probability of water being swallowed.
Livestock water supply	Protecting water quality to maximise the production of healthy livestock.
Irrigation water supply	Protecting the quality of waters applied to crops and pasture.
Homestead water supply	Protecting water quality for domestic use in homesteads, including drinking, cooking and bathing.
Drinking water at point of supply – Disinfection only – Clarification and disinfection – Groundwater	Refers to the quality of drinking water drawn from the raw surface and groundwater sources before any treatment.
Aquatic foods (cooked)	Refers to protecting water quality so that it is suitable for the production of aquatic foods for human consumption and aquaculture activities.

Table 4.2 NSW River Flow Objectives (uncontrolled streams)

River flow objective	Detail
Protect pools in dry times	Protect natural water levels in pools of creeks and rivers and wetlands during periods of no flows.
Protect natural low flows	Protect natural low flows.
Protect important rises in water levels	Protect or restore a proportion of moderate flows ('freshes') and high flows.
Maintain wetland and floodplain inundation	Maintain or restore the natural inundation patterns and distribution of floodwaters supporting natural wetland and floodplain ecosystems.
Manage groundwater for ecosystems	Maintain groundwater within natural levels and variability, critical to surface flows and ecosystems.
Minimise effects of weirs and other structures	Minimise the impact of instream structures.

4.2 Climate

Patched point climate data was obtained from the *Scientific Information for Landowners* (SILO) database operated by Queensland Government's Department of Environment, Tourism, Science and Innovation (DETSI, 2025*).* SILO point data consists of interpolated estimates based on historically observed data from the Bureau of Meteorology (BOM) climate stations. For this WIA, SILO data was obtained for the grid point (-34.05, 150.98), which is the Lucas Heights ANSTO station (Station No. 066023) located near the project footprint. Climate statistics for the project footprint between 1900 and 2024 are presented on Figure 4.2.

Review of BOM climate Köppen classification mapping indicates the project footprint is located in a temperate climate zone and is characterised by warm summers with no dry season (BOM, 2005). Strong seasonality is observed in temperature fluctuations, with temperature maximums typically reaching 25-27 degrees Celsius (ºC) in the summer months (January, February and December) and 16-17 ºC in the winter months (June, July and August). Temperature minimums showed temperatures reaching 15-17 ºC in the summer months (January, February and December) and 6-7 ºC in the winter months (June, July and August).

Monthly rainfall is relatively uniform throughout the year, with slightly increased median rainfall occurring in January, February and March compared with other months. The annual average rainfall is 1020.6 millimetres (mm), with a maximum of 2419.2 mm recorded in 2022 and minimum of 556.3 mm recorded in 1979.

Strong seasonality in evapotranspiration is observed throughout the year, with the highest monthly totals observed in January and December with 180.6 mm and 190.9 mm respectively. The annual average evapotranspiration is approximately 1456.4 mm.

A moisture deficit (monthly evapotranspiration less monthly rainfall) is observed in all months except for June. An average annual moisture deficit of 435.8 mm is observed, indicating the presence of moisture in environmental conditions are more strongly dominated by evapotranspiration throughout the year.

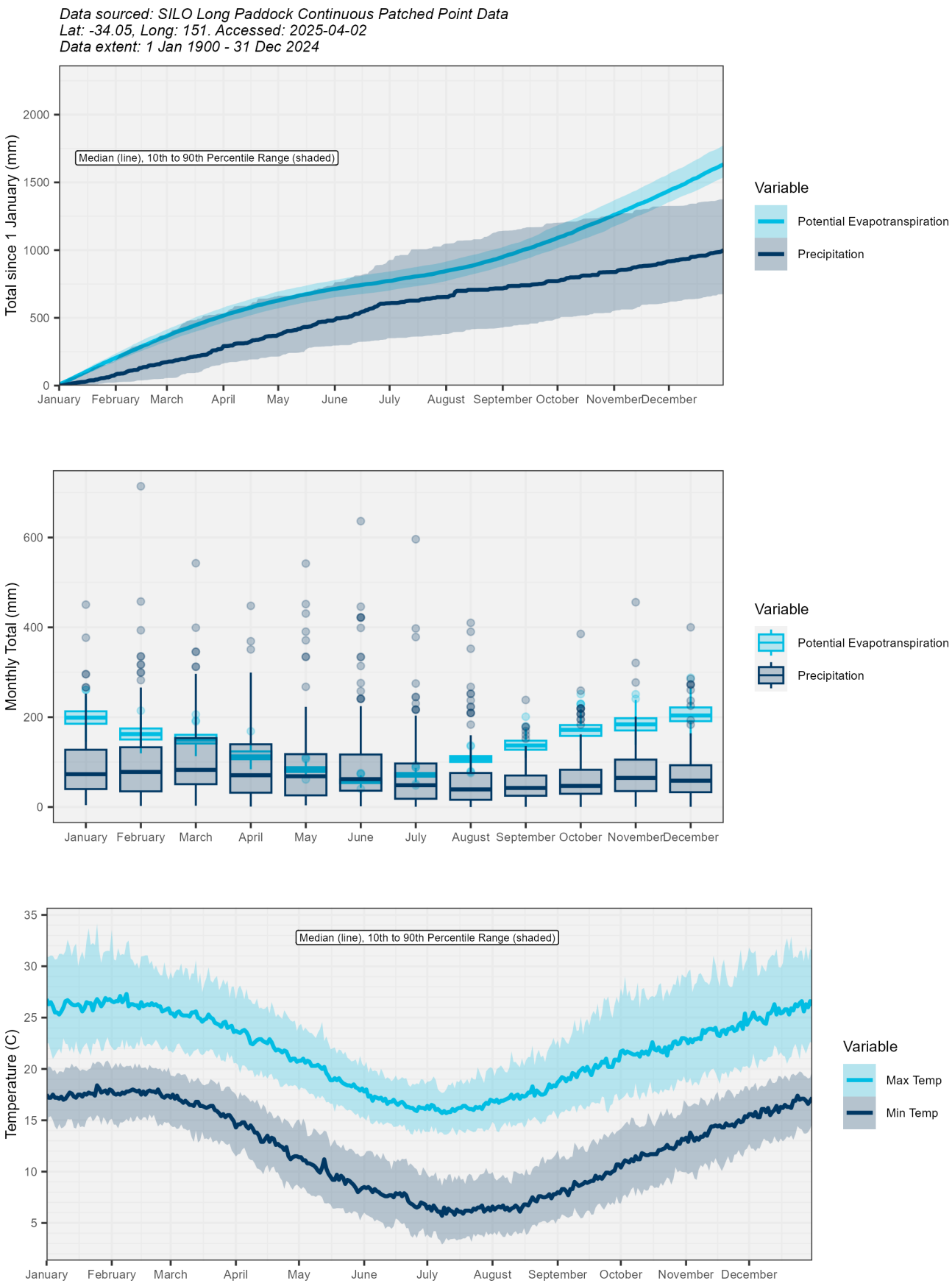


Figure 4.2 Climate statistics – SILO grid point (-34.05, 150.98)

4.3 Topography

The topography of the LHRRP is raised due to waste emplacement, rising to approximately 169 m Australian Height Datum (AHD) at its centre and sloping down on all sides, including towards the project site at a gradient of roughly 3%. This naturally forms two flow paths around the LHRRP, to the west towards Mill Creek and east of the landfill towards Bardens Creek.

The project site has slight variation in elevation falling from 160 m AHD in the south-west to 152 m AHD in the north-east of the lot towards Bardens Creek. Slopes in the project site are generally minor (around 3%).

4.4 Catchments and hydrology

Regionally, the project site is located within the Georges River catchment, a seventh order watercourse under the Strahler stream ordering system which ultimately flows to Botany Bay and the Tasman Sea. In the project vicinity there are two nearby watercourses, Bardens Creek to the north-east and Mill Creek to the west that ultimately runs north of the site. The project site is located within the Bardens Creek catchment.

4.4.1 Waterways

A first order ephemeral tributary to Bardens Creek is located approximately 250 m from the project site (according to the Strahler stream ordering system) which is the primary receiving environment from the project site. Bardens Creek itself is an ephemeral second order watercourse which begins approximately 1.1 km north-east of the project site and is a tributary of Mill Creek, connecting approximately 3.5 km downstream of the project site. The catchment of Bardens Creek is predominantly vegetated with bushland. According to the HEVAE (High Ecological Value Aquatic Ecosystem) instream value classification system, Bardens Creek has medium instream value in the vicinity of the project site (NSW DCCEEW 2024).

The headwaters of Mill Creek 250 m to the west of the site run north along the western boundary of the LHRRP. In the vicinity of the project site, Mill Creek is a first order ephemeral watercourse. Where Mill Creek meets with Bardens Creek approximately 3.5 km downstream, Mill Creek is a perennial third order watercourse. The upstream catchment of Mill Creek is predominantly well-vegetated, with the downstream catchment of Mill Creek and the catchment of an unnamed third order tributary being partially developed (in the areas of the suburbs of Barden Ridge, Menai and Alfords Point) Mill Creek has a medium HEVAE (High Ecological Value Aquatic Ecosystem) instream value in the vicinity of the project site (NSW DCCEEW 2024).

A review of the NSW River styles mapping (DPSI 2025) was undertaken to identify the geomorphic condition of the creeks. Both Bardens Creek and the Mill Creek reach closest to the project site were assessed in 2023 and identified to be confined, bedrock margin-controlled headwater creeks with bedrock beds. The geomorphic condition of both creeks was identified to be good, with conservation management listed as a priority. Both creeks were assessed as having low levels of fragility or sensitivity to disturbance.

The catchments and watercourses in the vicinity of the project site are mapped in Figure 4.3.

4.4.2 Existing site drainage

The site drainage for the existing bioenergy facility directs runoff to the perimeter of the facility where it is conveyed in existing kerbs and gutters along existing access roads, generally flowing north and northeast into existing sedimentation basins. Upstream runoff is collected along the western boundary of the facility, which is collected in an existing culvert and discharges north of the project site.

The existing drainage arrangement at the bioenergy facility provides an appropriate level of service for draining flows within the site and for managing upstream runoff. A map of the existing site stormwater layout is provided in Figure 4.4. No issues with flooding onsite have been identified during operations.

Paper Size ISO A4

0 100 200 300 400

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

LMS Energy
Lucas Heights Bioenergy Facility

Project No. **12649882**
Revision No. **0**
Date **13/10/2025**

Catchments, hydrology and wetlands

FIGURE 4.3

\\ghdnet\ghd\AU\Sydney\Projects\21\12649882\GIS\Maps\Deliverables\12649882_Water.aprx
Print date: 13 Oct 2025 - 19:22

Data source: LPMA: DTDB/DCDB, 2019. Nearmap WMS Server: .
Created by: dbbanatin

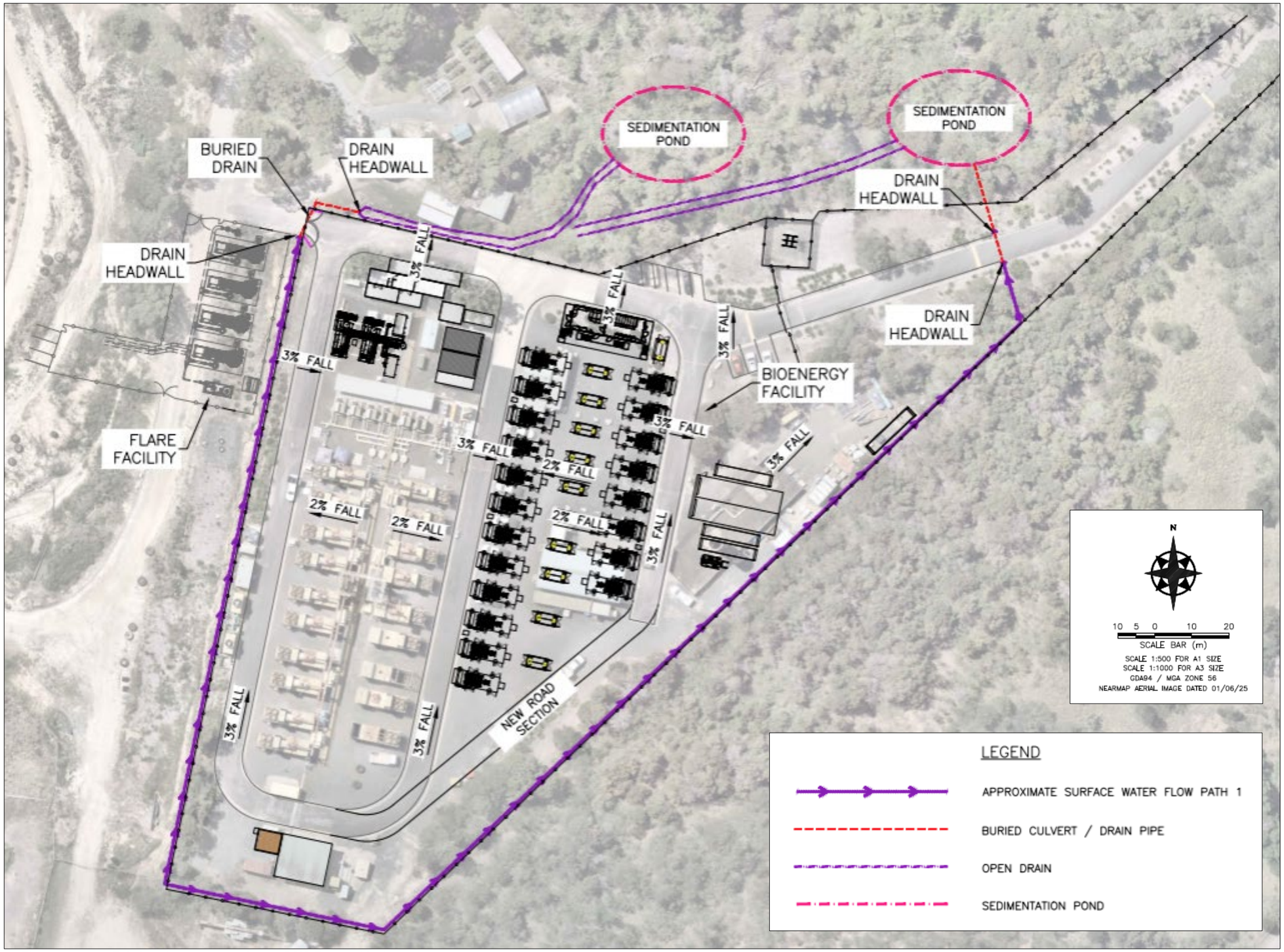


Figure 4.4 Existing site stormwater layout (LMS Energy, 2025)

4.5 Surface water quality

A review of publicly available baseline water quality monitoring data was undertaken within the vicinity of the project site, including Bardens Creek and Mill Creek.

4.5.1 Sutherland Shire Waterways Health Report Card

Sutherland Shire Council supports a Strategic Water Monitoring Program which involves monthly physical and chemical monitoring of waterways within the Sutherland Shire LGA, including Bardens Creek (Sutherland Shire Council, 2025). Bardens Creek is the primary receiving environment for this project. Report cards are produced annually based on these monitoring results and include a site grade to qualitatively evaluate the overall condition of the waterway. These results are provided in Table 4.3, with the latest results indicating excellent overall condition. Council monitors the physical and chemical components of the waterway, including ammonia, nitrogen, phosphorous, metals, dissolved oxygen and total suspended solids. The water quality grade is determined by comparing the results with historical data from council's reference waterways.

The results suggest that Bardens Creek has excellent water quality, with the exception of a period from 2018 to 2019 where water quality was somewhat reduced (potentially due to impacts of drought given the recovery of water quality in following years). There is no evidence to suggest that the project site is negatively impacting water quality in the watercourse. This indicates general compliance with the WQOs for Bardens Creek (outlined in section 4.1).

Table 4.3 Sutherland Shire Waterways Health Report Card results for Bardens Creek (Sutherland Shire Council, 2024a)

Year	Reported Element	Rating	Definition
2023/2024	Site Grade	A+	Excellent condition
2019/2020	Site grade	A+	Excellent condition
2018/2019	Site grade	C+	Fair condition
2013/2014	Site grade	A+	Excellent condition

4.5.2 Mill Creek Aquatic Ecology Baseline Report

Water quality sampling at the LHRRP has been undertaken by GHD between 2023 to 2025 to support the development of the LHRRP Mill Creek Aquatic Ecology Baseline Reports. As noted in section 4.4, the project site drains towards Bardens Creek. While no sampling of Bardens Creek was undertaken, monitoring was conducted within Mill Creek immediately downstream of LHRRP (site MC1: -34.03606°, 150.96474°), approximately 1.5 km north west of the project site. It is noted that the headwaters of Mill Creek originate within the LHRRP site and therefore upstream monitoring data is also affected by operations at LHRRP. Water quality results at MC1 were compared against default guideline values (DGVs) from ANZECC (2000) and ANZG (2018).

In the Spring 2024 and Autumn 2025 sampling events (GHD, 2025a), pH and EC results were within the DGV range at MC1. However, pH results were slightly alkaline at a sampling location upstream of MC1 for both events. DO saturation was hypoxic within Mill Creek for both events and was higher overall in the Autumn 2025 event compared to the Spring 2024 event. MC1 had higher major ion concentrations for both sampling events, and dissolved metal concentrations were generally below DGVs, with the exception of high copper concentrations identified at MC1 during the spring 2024 event. Nutrients, including NOx, TN, and TP, were elevated at MC1 for both events, exceeding DGVs.

4.6 Soils and geology

4.6.1 Soils

A review of published soil mapping within the vicinity of the project site has been undertaken based on soil landscape mapping and (ASC) mapping (DPIE, 2022b) is provided in Table 4.4 and shown spatially on Figure 4.5.

The project site itself lies fully within the Lucas Heights soil landscape. There are areas of disturbed terrain to the north of the project site where landfilling operations have occurred, and the Hawkesbury soil landscape underlies the nearby Bardens and Mill Creeks. Soil mapping over the project site is available on Figure 4.5.

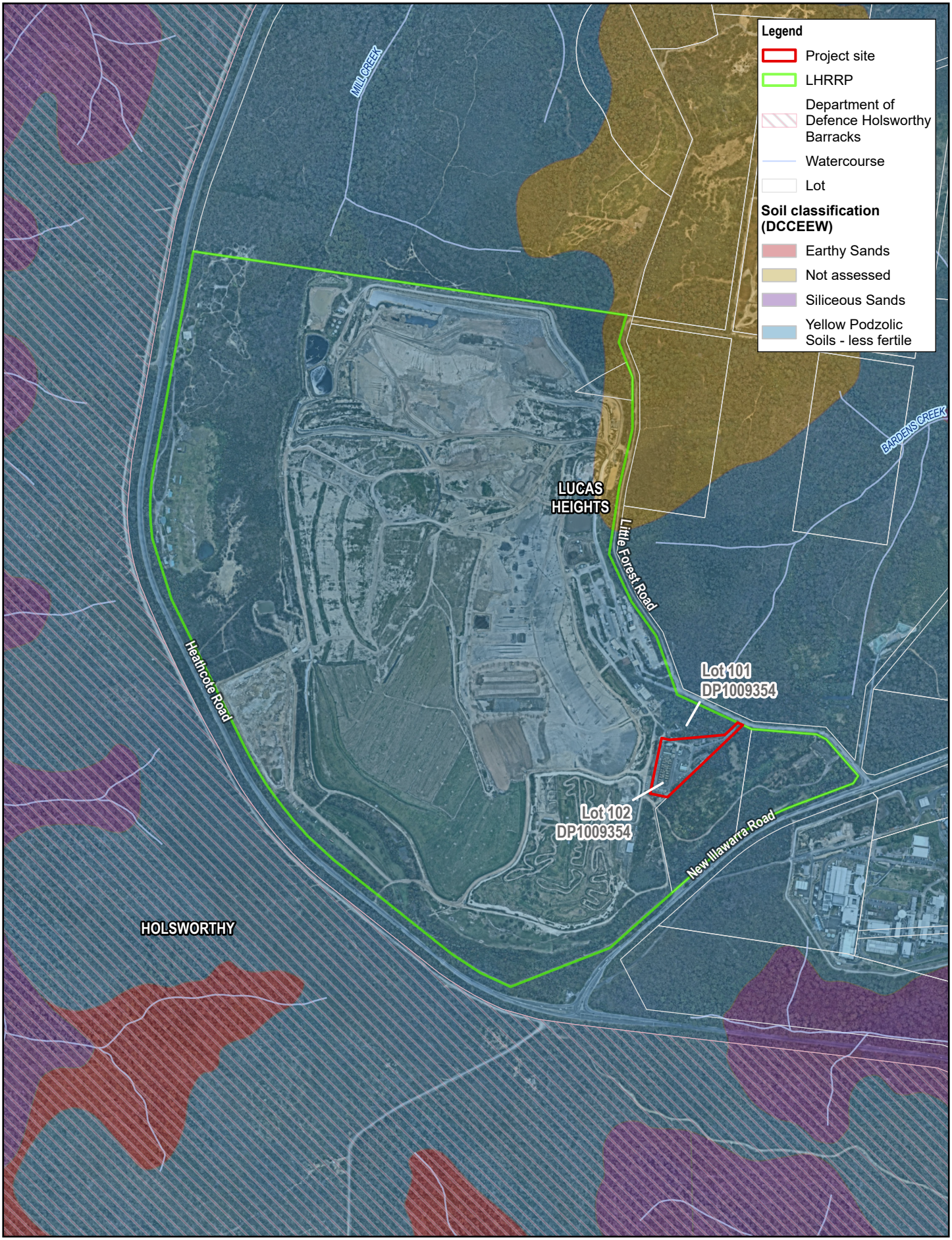
Table 4.4 Relevant soil landscapes within the project site

Soil Landscape	Soil attributes
Lucas Heights (9029lh)	Landscape—gently undulating crests ridges and plateau surfaces of the Mittagong Formation (alternating bands of shale and fine-grained sandstone). Local relief to 10-50 m. Slopes <10%. Rock outcrop is absent. Extensively to completely cleared dry sclerophyll low open-forest and low woodland. Soils—moderately deep (50–150 cm), comprising of: – Ridges and plateau surfaces: • Yellow Podzolic Soils and Yellow Soloths (Dy2.41). These are layered soils with a sandy or loamy surface overlying clay-rich subsoil. Soils often become hard and compacted when dry. Limiting infiltration and plant growth. • Lateritic Podzolic Soils (Dy3.61). These soils are similar in profile to Dy2.41, but with iron and often aluminium, rich layers (laterite) that can form near the surface, particularly on crests – Shoulders of plateaus and ridges: Yellow Earths (Gn2.24). These soils generally are better drained, being more uniform in particle size, than podzolic soils. Typically, soils have a yellow colour resulting from oxidised iron. Soil structure is relatively better than podzolic soils. – Valley flats: Earthy Sands (Uc5). Found in lower areas within the landscape, these soils are typically, deeper, with loose-textures soils (typically sands or sandy soils), with a low water-holding capacity, relatively higher infiltrations rates and fertility. Limitations—stoniness, hard-setting surfaces, low-soil fertility. Erosion: Generally low, with minor gully and sheet erosion occurring occasionally along unpaved roads.

A review of the Sutherland Shire LEP acid sulfate mapping found that there were no acid sulfate soils underlying the project site or in the vicinity of the project site (Sutherland Shire Council, 2018).

4.6.2 Geology

The project site is located within the Sydney basin on the Woronora Plateau, which contains rocks of Permian and Triassic age. The surface geology at the project footprint has been obtained from *Wollongong – Port Hacking 1:100,000 Geological Map* (NSW Department of Mineral Resources, 1985). The project site is underlain by Triassic-aged Hawkesbury Sandstone, which is described as “medium to coarse-grained quartz sandstone, very minor shale and laminate lenses”. Hawkesbury Sandstone is underlain by Triassic-aged claystone and Permian-aged sandstone and claystone. The geology underlaying the project site is shown in Figure 4.6.



Paper Size ISO A4

0 100 200 300 400

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

LMS Energy
Lucas Heights Bioenergy Facility

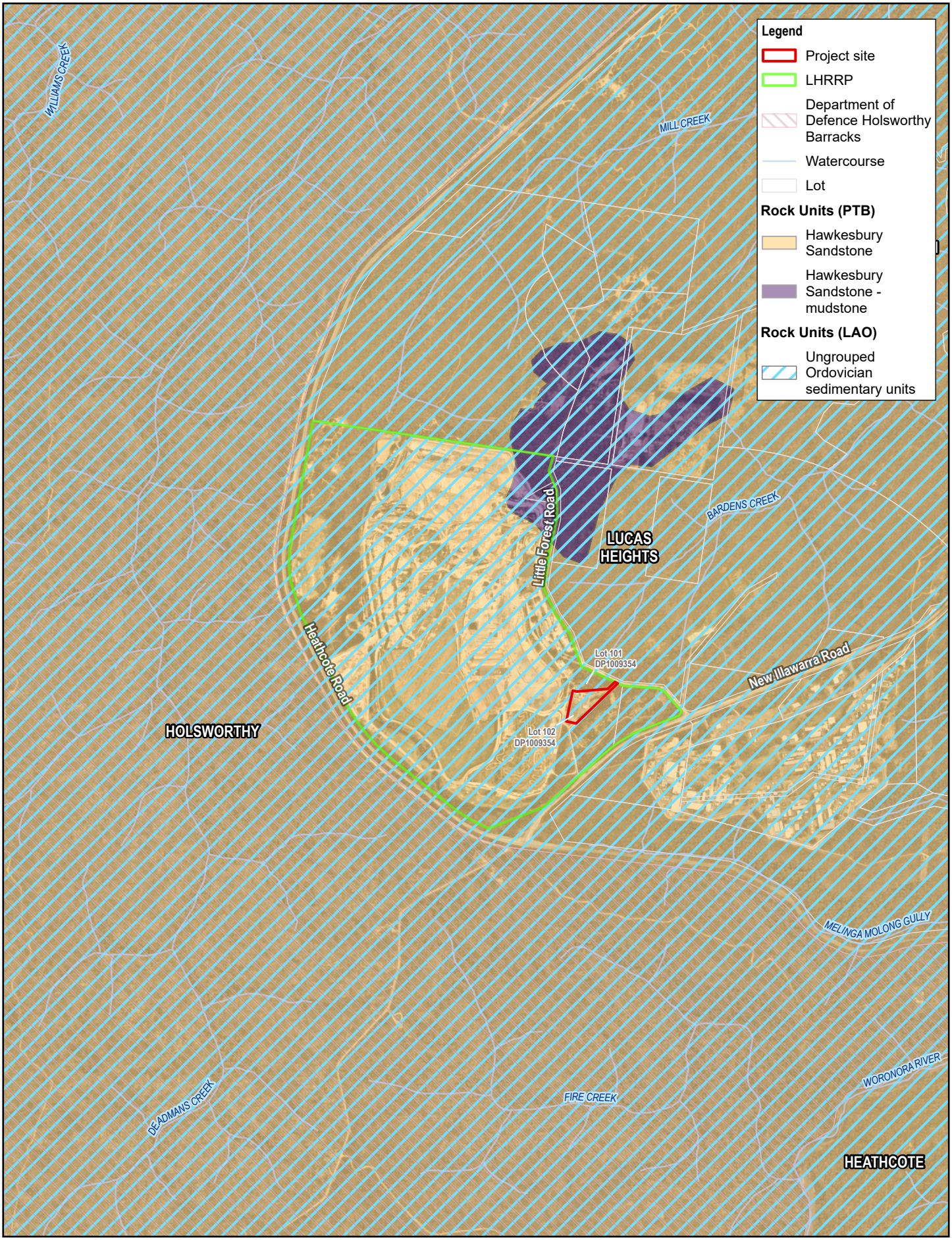
Soils

Project No. **12649882**
Revision No. **0**
Date **13/10/2025**

FIGURE 4.5

\\ghdnet\ghd\AU\Sydney\Projects\21\12649882\GIS\Maps\Deliverables\12649882_Water.aprx
Print date: 13 Oct 2025 - 19:24

Data source: LPMA: DTDB/DCDB, 2019. Nearmap WMS Server: .
Created by: dbbanatin



Paper Size ISO A4

0 100 200 300 400

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

LMS Energy
Lucas Heights Bioenergy Facility

Geology

Project No. **12649882**
Revision No. **0**
Date **13/10/2025**

FIGURE 4.6

\\ghdnet\ghd\AU\Sydney\Projects\21\12649882\GIS\Maps\Deliverables\12649882_Water.aprx
Print date: 13 Oct 2025 - 19:24

Data source: LPMA: DTDB/DCDB, 2019. Nearmap WMS Server: .
Created by: dbbanatin

4.7 Groundwater

4.7.1 Groundwater levels, quality and yield

4.7.1.1 Groundwater levels

Cleanaway Pty Ltd are required to undertake groundwater monitoring at 19 groundwater bores located in the vicinity of the LHRRP in accordance with EPL 5065. Review of the 2024 Annual Environmental Monitoring Report (Cleanaway, 2025) and the LHRRP Water Management Plan (Douglas Partners, 2024) was undertaken to establish the underlying groundwater characteristics in the vicinity of the project. MB008, MB009, MB044 and MB045 are the nearest upgradient monitoring bores to the project site, located between 100 and 250 m from the proposal. Groundwater levels are shown to be approximately 3.9 to 18.8 m bgl , assuming a standpipe casing height of 0.8 m above surface level.

Geotechnical boreholes constructed during recent geotechnical investigations at the project site identified saturated materials at 0.1 – 1.2 m below ground level (155.5 – 157.3 m AHD), however given recent rainfall prior to construction it is understood that this reflects soil moisture or small quantities of perched waters on bed-rock. Previous studies at the site generally show local groundwater being multiple times deeper than those observed in the geotechnical boreholes inferred to be around 8 m bgl.

Given no substantial quantities of cut are required for the project, interaction of local groundwater is not anticipated for the project.

4.7.1.2 Groundwater quality

Indicators include higher alkalinity, electrical conductivity, ortho-phosphorus, longer chain petroleum hydrocarbons, BTEX and naphthalene. It is noted there is limited groundwater quality information publicly available, with this information being limited to ammonia (Cleanaway, 2025). All wells including MB008 (up gradient) have variations in ammonia concentrations up to 1 mg/L, indicating that ammonia concentrations may vary naturally (GHD, 2015).

4.7.1.3 Groundwater yield

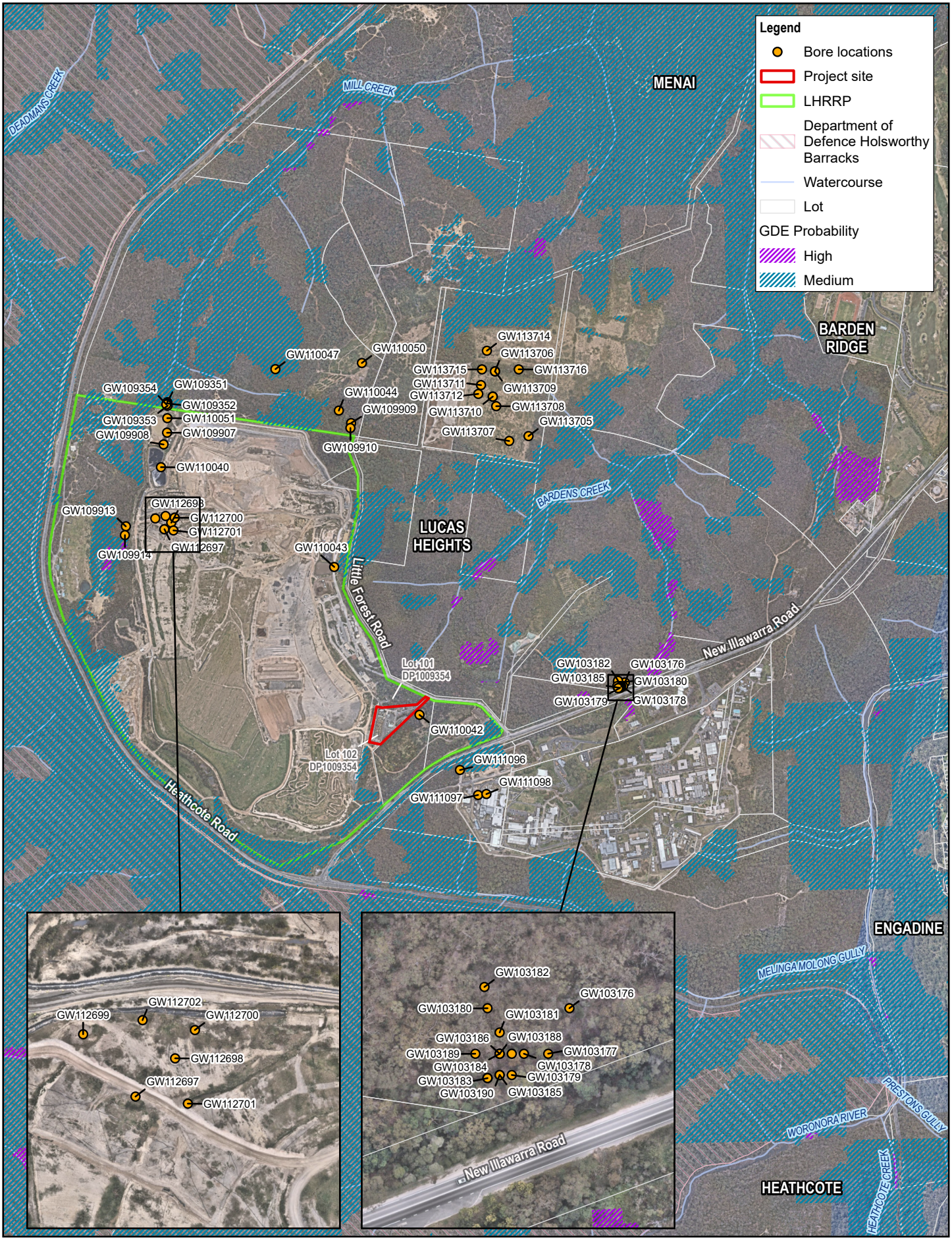
In 1994, Douglas Partners conducted hydraulic conductivity testing across the LHRRP site, where transmissivity in the sandstone formation at depths of 5 to 15 m bgl in the vicinity of the landfill site (outside of the fracture and jointing zones near Mill Creek) range from 0.1 to 3 m^2/day (Douglas Partners, 2024). Groundwater flow directions are also considered to flow north to northwest. As identified in Douglas Partners (2024), the associated flow rates are considered to be low and unlikely to support a high enough yield for uses such as irrigation and stock and domestic.

4.7.2 Potential groundwater receptors

A search of nearby potential groundwater receptors, including registered groundwater bores and groundwater dependent ecosystems, was undertaken using a 1 km radius from the project site. All identified registered groundwater bores and groundwater dependent ecosystems in the vicinity of the site are mapped on Figure 4.7.

4.7.2.1 Registered groundwater bores

A search of the WaterNSW Real Time Data register (WaterNSW, 2025) was conducted to identify nearby registered groundwater bores, which have the potential to be impacted by the project. All 19 bores were constructed for the purpose of monitoring, with no registered water supply works identified within a 1 km radius of the project site. Depths of groundwater ranged from around 5 to 15 m bgl. A review of bores within a 5 km radius also showed no landholder water supply works were present. This indicates there is no beneficial use of the underlying groundwater currently in operation.



Paper Size ISO A4

0 100 200 300 400

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

LMS Energy
Lucas Heights Bioenergy Facility

Groundwater dependent ecosystems and bores

Project No. 12649882
Revision No. 0
Date 13/10/2025

FIGURE 4.7

4.7.2.2 Groundwater dependent ecosystems

Groundwater dependent ecosystems (GDEs) were reviewed based upon the Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources 2023 (DPE Water, 2023) and GDE Atlas (BOM, 2025). Where additional information on the ecological value was available, observations were supported by the High Ecological Value Aquatic Ecosystems dataset (HEVAE – DCCEEW, 2018). Observations, include that:

– GDEs of varying probability are present within 1 km of the site, including:
  - Areas of low probability GDE vegetation are mapped to the north and east of the project site.
  - Areas of high probability GDEs (Sydney Coastal Upland Swamp Heath) were identified and characterised to have a medium ecological value. The closest GDE being approximately 400 m northeast of the project site. This vegetation is mapped as highly distinctive, with medium naturalness, low vital habitat and medium diversity characteristics.
– There are no high priority GDEs mapped within 1 km of the project site.

4.8 Existing flood condition

The existing flood condition of the site was determined based upon the site's topography and location within the catchment and is supported by flood planning maps published by the Sutherland Shire Council (2024b). The site is located on a high-point along the local ridgeline, with no notable quantities of upstream catchment that could result in riverine flooding. Rainfall runoff is currently managed through stormwater drainage. Further, the project site is not located in a Flood Planning Area and the site is not expected to be impacted by flooding.

5. Operational stormwater management

Operational stormwater at the site will be managed similar to existing, with minor additions to the drainage system being proposed to allow for upstream runoff to be diverted around the site and into the existing sedimentation basins. The proposed conceptual stormwater management plan is shown on Figure 5.1.

As significant changes to land use or increases in impervious areas are not proposed as part of the project, additional stormwater quality controls are not anticipated to be required, and the existing sedimentation basins and drainage infrastructure will continue to service the project site, with runoff being collected onsite and being conveyed in a north-easterly direction towards the existing sedimentation basins.

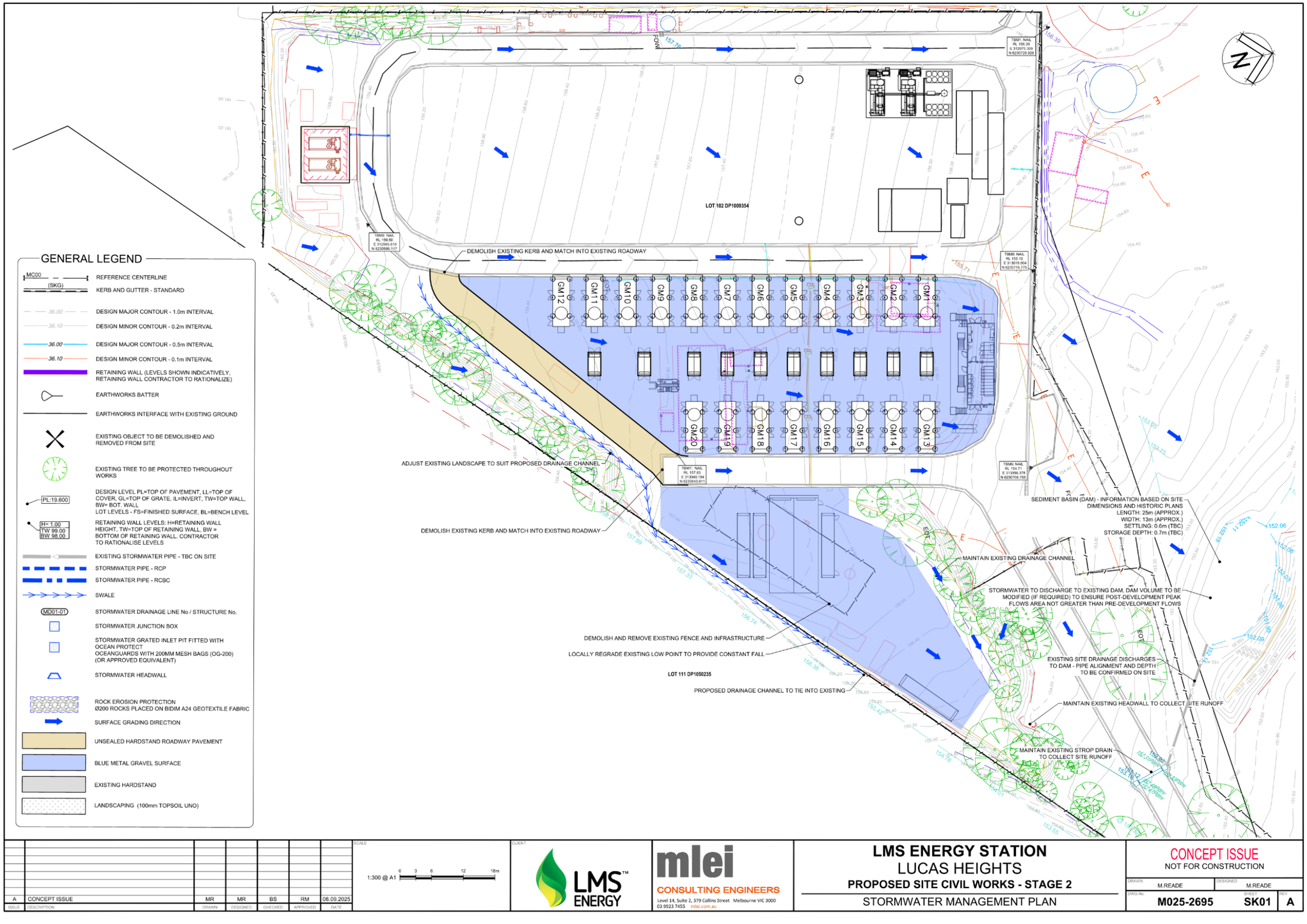


Figure 5.1 Proposed conceptual stormwater management plan (MLEI Consulting Engineers, 2025)

6. Impact assessment

6.1 Hydrology and drainage

An assessment of the potential changes to the hydrology and drainage across the project site has been undertaken with consideration of the construction and operational phase requirements of the project.

6.1.1 Construction

Surface water runoff from the construction of the bioenergy facility, and from small quantities of upgradient catchment would continue to report to the Bardens Creek catchment. Construction activities have the potential to alter local runoff patterns within the site arising from minor earthworks at the site, including those required to construct drainage works.

It is recommended that mitigation measures are applied to prevent inundation of these areas and to enable stormwater conveyance around the bioenergy facility.

Given the relatively small works area within the Bardens Creek catchment, the resulting changes to local runoff patterns during construction are anticipated to be relatively minor and of low to negligible impact on regional hydrology. The measures proposed to mitigate these impacts are outlined in section 7.1.

6.1.2 Operation

The final operational configuration of the project would utilise and be similar to the existing stormwater drainage system at the site. Impacts associated with hydrology and drainage during operation are anticipated to be minor to negligible.

6.2 Surface water quality

6.2.1 Construction

Various activities associated with the construction of the project have the potential to impact surface water quality. These activities include:

– Removal of existing infrastructure, minor excavations and small quantities of disturbance of soils. These have the potential to mobilise surface sediments resulting in erosion and sedimentation, causing downstream water quality impacts such as elevated levels of suspended solids.
– Handling and operation of equipment and substances such as fuels, coolant, and bulk oils which may have the potential to contaminate surface runoff and enter local drainage pathways and enter downstream waterways.

Handling, storage and removal of buried materials are not anticipated to be required, however given the potential higher risk to downstream environments, has been included below.

The potential for each of these activities to impact on watercourses is outlined below.

Erosion and sedimentation

Disturbance of in-situ and stockpiled soils has the potential to result in erosion and sedimentation, without appropriate implementation of erosion and sediment control measures. Activities which may increase the risk of erosion include clearing and grubbing, trenching, earthworks, excavations and any activity where the existing surface is disturbed. Once disturbed, sediments are prone to being mobilised into downstream waterways primarily from rainfall derived runoff or aeolian forces. If mobilised, there is an increased risk of impact to downstream water quality, through increased loads of suspended solids or an increase in turbidity within waterways. With no mitigation applied, this material may become mobilised into downstream waterways, where impacts to both flora and fauna may occur, and would vary in terms of persistence and severity.

Trenching activities are proposed for the construction and installation of the gas piping and transmission connection to a maximum of 1.5 m. These activities are not located within proximity to Bardens Creek or any waterway. As progressive backfilling and rehabilitation of trenched areas is proposed, standard erosion and sediment controls are expected to be sufficient to minimise risk of erosion and sedimentation. No additional consideration of the controlled activities guidelines for instream works (DPE, 2022b) are required.

The scale of disturbance proposed for the bioenergy facility is relatively small based upon the site area (approximately 1.8 ha) and the volume of earthworks required. A soil loss hazard assessment was undertaken (see section 6.3) and identified the soil loss hazard to be 'very low'. Additionally, monthly variation in rainfall was considered in completion of a monthly soil loss hazard assessment, which determined that for all months of the year, construction would be associated with very low erosion hazard. Impacts to receiving catchment and waterways associated with sedimentation are therefore anticipated to be minor and can be suitably managed through the implementation of standard sediment and drainage controls.

Hazardous materials

The handling of materials hazardous to downstream waterways is required during construction of the project. Potential activities where handling of hazardous materials could occur may include:

– maintenance and refuelling of plant (e.g. hydrocarbons)
– accidental spills or loss of containment of stored materials (e.g. fuels, oils, coolant)
– accidental spills during the installation of plant or similar infrastructure (e.g. concrete, oils and coolant)
– disturbance, handling and disposal of potential and unexpected contamination that poses a risk to water quality (refer to the Contamination Preliminary Site Investigation (GHD, 2025b)):
    - imported fill material of unknown quality and extent.

The handling, use and storage of fuels, coolants and oils is a common activity to most construction sites, and as such, the nature of these risks are well understood. This risk is most likely to result in minor water quality impacts if rainfall generating runoff from the project site occurs prior to remedial actions. While a risk is present, the likelihood is relatively low and anticipated to present a minor risk.

Suitable controls for the risks associated with hazardous materials during the construction phase are outlined in section 7.1.

6.2.2 Operation

Potential water quality impacts during operation of the project were identified and characterised as follows:

– Minimal changes to site drainage are anticipated to result in a very minor to negligible impact to offsite stormwater quality. Site runoff would continue to be collected in the existing sedimentation basins.
– Specific risks associated with the nature of the proposed activity (e.g., use of bulk oils, coolants and other chemicals) that are not necessarily applicable to typical urbanisation activities. The project proposes that the following hazardous materials are stored onsite, in covered and bunded storage areas:
    - A maximum of 30 kilolitres (kL) of fresh oil
    - A maximum of 40 kL of waste oil
    - A maximum of 4 kL of fresh coolant
    - A maximum of 0.35 kL of other miscellaneous hazardous liquids.

Specific risks

Specific activities associated with the operation of the project that may cause impacts to downstream waterways include the release of potential hazardous materials into downstream waterways. Potential mobilisation of materials into downstream waterways may occur either via direct flow of the material itself, or through washing from rainfall derived runoff. Once mobilised into downstream waterways, impacts to both flora and fauna are possible and would vary in terms of persistence and severity.

Handling of materials that pose enhanced water quality risks is anticipated to occur from time to time (i.e. hydrocarbons, oils and coolants), as part of operation and maintenance. Waste oil and coolant is to be removed from the site by a licensed liquid waste contractor and will not be discharged to any waterway. Whilst accidental

spills of stored materials may occur, it is understood these potential contaminants would be contained within a fully enclosed covered and bunded system. As a result, these materials are anticipated to pose a low risk to local water quality.

It is noted that water quality within Bardens Creek has been characterised as being in “excellent condition” by Sutherland Shire Council (see section 4.5.1) in recent years, during the operation of the existing power station since 1998. Given that this project intends to be a like-for-like replacement of the existing power station, there is not expected to be any operational surface water quality impacts that influence conditions in Bardens Creek. Potential operational phase water quality impacts associated with material handling may result in low localised impacts to nearby waterways but are not anticipated to result in any notable changes to Bardens Creek or the Georges River. Mitigation measures are recommended to manage this impact.

6.3 Soil resources and riparian land

A review of the potential impacts of construction and operation of the project with respect to soil resources, riparian zones and waterfront land has been undertaken. Waterfront land is defined as all land within 40 m of the highest bank of the river, lake or estuary and includes the bed and bank of any river lake or estuary.

The potential impacts to soil resources and riparian land include:

– Direct impacts, associated with:
  - works that would directly disturb, move or mobilise soils
  - works in riparian zones, including removal of riparian vegetation, channel bank disturbance or instream disturbance.
– Indirect impacts, associated with changes to soil, water quality or hydrologic regime which may impact both soils generally and the ground conditions required for riparian vegetation survival. These are discussed in the above sections.

The proposed construction and operation activities were reviewed in relation to both soils in the vicinity of the project site and riparian zones in the nearby waterway of Bardens Creek.

6.3.1 Construction

Direct impacts to soils to establish the construction area within the project site, which would include earthworks, including trenching for underground services.

There is a minimal risk of indirect impacts to the riparian zone or soils of Bardens Creek anticipated to occur as a result of construction activities, given the duration of works and that the project site is located 250 m from a first-order tributary of Bardens Creek. Mitigation measures associated with these risks are proposed in section 7.1.

6.3.2 Operation

There are no ongoing activities proposed for the operational phase of the project that would result in impact to local soils or riparian zones on Bardens Creek. As described in section 6.2.2, operational phase water quality impacts relating to stormwater are not anticipated.

6.4 Groundwater

6.4.1 Construction

Potential impacts to groundwater during construction and operation include:

– interception of groundwater during site earthworks, including excavation and levelling activities for foundations
– impacts to groundwater quality associated with surface water contamination from hydrocarbons and chemical spills.

Groundwater interception

Based upon required limited quantities of earthworks for trenching and foundation construction, up to 1.5 m deep. Interception of local groundwater from the project is considered unlikely to occur, based on the existing groundwater level information at adjacent historical groundwater elevations. While impacts are not anticipated, recent geotechnical boreholes identified some waters were encountered at shallower depths, and while these are considered to be relatively minor quantities or potentially soil moisture following rainfall, mitigation measures for unexpected groundwater interception are recommended to be included in the CEMP.

Groundwater quality

Construction of the project has the potential to impact on groundwater quality via contamination by hydrocarbons from accidental fuel and chemical spills to surface water. Hazardous chemical handling risks (e.g. fuels) are typical of works of this nature and well understood control measures are commonly used, such as bunding, safely storing hazardous materials, and visual inspection of the works area and waterways. Impacts to water quality are anticipated to be low and accordingly any subsequent impacts to groundwater are not anticipated given the relatively lower likelihood of contamination.

NSW Aquifer Interference Policy

The potential impacts on water supply works, GDEs, high priority culturally significant sites, and groundwater quality have been assessed against the Level 1 Minimal Impact Considerations of the NSW Aquifer Interference Policy (AIP).

In summary of the below, the construction of the project is not predicted to result in changes in groundwater levels at surrounding bores, GDEs or culturally significant sites, or changes in groundwater quality. Therefore, the construction of the project is within the Level 1 Minimal Impact Considerations in the NSW AIP.

Water supply works

As described in section 4.7.1, there were no water supply works identified within a 5 km radius of the project site. As no groundwater interception or take is anticipated during the construction phase of the project, there would be no impact on any future water supply works that may be installed during the construction phase of the project.

Therefore, the project is not predicted to result in drawdown at any water supply work.

Groundwater dependent ecosystems

Review of the Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources 2023 map indicates there are no high priority GDEs located within 1 km of the project site. The nearest High Priority GDE is located approximately 2.2 km from the project site and is mapped as Sydney Coastal Sandstone Riparian Scrub in the HEVAE dataset (DCCEEW 2018). As discussed above there is no groundwater interception expected as a result of construction activities, with no resulting drawdown anticipated as a result of construction activities. Therefore, the project is not predicted to result in drawdown at any high priority GDEs listed in the relevant WSP.

High priority culturally significant sites

There are no high priority groundwater dependent culturally significant sites listed in the relevant water sharing plan. Therefore, the project would not result in any impacts on a listed culturally significant site.

Groundwater quality

Construction of the project has the potential to impact on groundwater quality via contamination by hydrocarbons and coolant from accidental oil and chemical spills, and the disturbance of in situ contaminated materials. With the implementation of mitigation measures included in section 7.1, the project is anticipated to result in negligible groundwater quality impacts.

6.4.2 Operation

Potential risks to groundwater quality during the operational phase include chemical leaks and spills during maintenance activities. The management of such events would continue to be managed in accordance with a site specific OEMP, as noted in section 7.2. Given that oils, coolants and chemicals will be stored within covered bunding systems, there is limited potential for these contaminants to affect local groundwater.

As there are no ongoing extractive works required for the operation of the project, there will be no changes in groundwater levels at surrounding bores, GDEs or culturally significant sites, or changes in groundwater quality.

Therefore, the operation of the project is compliant with the Level 1 Minimal Impact Considerations in the NSW AIP.

6.5 Water balance

6.5.1 Construction

Water sourcing

The project site would require water (for dust suppression and earthworks) during the construction phase. Predicted water demand information for the construction works are summarised in Table 6.1.

Table 6.1 Indicative construction water demand requirements

Description	Month of construction program								Total (kL)
	1	2	3	4	5	6	7	8	
Personnel									
Mobilised LMS	6	10	10	10	10	6	6	6	
Mobilised Contractors	8	12	12	12	12	10	4	4	
Total	**14**	**22**	**22**	**22**	**22**	**16**	**10**	**10**	
Water Consumption (kL/month)									
Handwashing and amenities	0.28	0.44	0.44	0.44	0.44	0.32	0.2	0.2	**2.76**
Dust suppression	16	16	16	16	16	16	16	16	**128**
Compaction	8	8	8	-	-	-	-	-	**24**
Contingency	4.9	4.9	4.9	3.3	3.3	3.3	3.2	3.2	**31**
Total (kL/month)	**29.18**	**29.34**	**29.34**	**19.74**	**19.74**	**19.62**	**19.4**	**19.4**	**185.76**

As summarised in Table 6.1, the total water demands required for construction are approximately 185 kilolitres (kL) for the 8-month duration of works.

Construction water demands include dust suppression (128 kL), compaction (24 kL) and contingency (31 kL) to permit construction works in dry climatic conditions. Construction water would either be sourced from onsite sources at LHRRP, in consultation with Cleanaway or using an existing potable water connection.

The remaining 2.76 kL is required for the purpose of handwashing and amenities use. This would be supplied through an existing mains connection within existing amenity facilities. Drinking water will be supplied as bottled water.

Extraction from surface water or groundwater sources under WAL entitlement is not proposed. No impacts to surface or groundwater resources arising from supply are anticipated given the relatively minor quantities of water required, that would be sourced externally.

Wastewater disposal

Additional wastewater is not anticipated to be generated during the construction phase. If wastewater is generated during the construction phase, this water would be removed from site and disposed of at a licenced treatment facility. No trade waste disposal or off-site discharges are proposed or required. Site amenities at the existing power station would be utilised during the construction phase.

Impacts associated with wastewater disposal are not anticipated.

6.5.2 Operation

Water sourcing

Water demands during the operation of the bioenergy facility are expected to be limited to the use of site amenities by the project staff and are likely to comprise less than 1.44 kL annually based on the construction water amenity demand (scaled to 6 personnel). The site amenities would be supplied from an on-site potable water reticulation location, supplied by mains water. Water demands would remain consistent with the current operation, with no changes or impact on surface or groundwater resources.

Water consumption

No process water would be consumed for the operation of the bioenergy facility.

Wastewater

Domestic wastewater (blackwater and greywater) would be collected and disposed of via the existing wastewater management infrastructure which is a pumped septic system which returns to the ANSTO site. The project site has an existing sewer lateral connecting to infrastructure on Little Forest Road. The volume of domestic wastewater to be disposed of would generally be equivalent to the volume required for use in the site amenities (1.44 kL/year). No treatment or off-site discharges are required and impacts to surface or groundwater resources are not anticipated.

6.6 Cumulative impacts

An issue-specific cumulative impact assessment has been undertaken, considering relevant future projects located within the catchment of the Georges River (to the extent of Botany Bay). A search of the NSW Major Projects Website was undertaken on 24 August 2025, considering the LGA's of Sutherland Shire Council and Georges River Council.

While the individual impacts of these projects may be minor, when they occur at the same time as the project, they may result in material impacts on the receiving environment. A summary of identified future projects identified is included in Table 6.2.

Table 6.2 Projects identified within the Georges River catchment

Project and status	Location and distance from site	Key element	Summary of assessment	Relevance to project	Impact assessment
LHRRP Western Expansion (SSD-78269209) Status: Prepare EIS (Planning NSW, 2025)	Little Forest Road, Lucas Heights 2234 Distance: Additional project at project site (approximately 500m)	Water quality	Expansion of the LHRRP to include extension of the landfill to the west (Western Area) of the existing landfill footprint, construction of a restricted waste cell and relocation of leachate / stormwater dams.	The LHRRP expansion is located at the same facility and is west of the project site boundary. The LHRRP is located within the headwaters of the Mill Creek catchment, a tributary of the Georges River. Stormwater runoff from the project would report to Bardens Creek, a tributary of Mill Creek.	There is potential for cumulative impacts associated with the quality of stormwater runoff, however, considering both projects propose to independently manage/treat stormwater, these impacts are expected to be limited given the landfill stormwater system is anticipated to overflow only 1 to 2 times per year. The project would manage and treat stormwater to a suitable level to not result in impacts to stormwater and therefore, cumulative impacts are not anticipated during either construction and operation of the project.
Flaring Facility (SSD 6835 – modification 3) Status: Determination (Planning NSW, 2025)	Little Forest Road, Lucas Heights 2234 Distance: Associated project adjacent to project Site	Water quality and volume	The modification report GHD (2025d) states that appropriate stormwater controls would be implemented during the design and installation of the required works and during ongoing operation in accordance with the CEMP and OEMP for the site.	The flaring facility is located immediately north of the project and is located 250 m from Bardens Creek.	As stated in GHD (2024), the commercial arrangements for the existing power station (DA #970251) proponent are due to end on 31/12/2025. At this time the proposed flares would commence operation and will be integrated with the new bioenergy facility. Therefore, there may be some overlap in construction activities occurring for both projects. However, as the project would implement erosion and control measures for the whole project site, no cumulative impacts to receiving waters are anticipated to occur. This project has not been constructed.
Shop top housing with affordable housing - Willarong Road and President Avenue Caringbah (SSD-72600478) Status: Determination (Planning NSW, 2025)	178-186 Willarong Road, 41-47 President Avenue and 51 President Avenue, Caringbah (North of Georges River) Distance: 26.5 km	Groundwater	Dewatering Management Plan (Morrow Geotechnics Pty Ltd, 2024) Dewatering required for the project expected to be within the Level 1 Minimal Impact considerations under the AIP. Dewatering volumes would be within the 3 ML exemption limit for construction activities under the WM Act.	Insignificant volumes to be dewatered. No dewatering is proposed for the project.	While these projects are located within the catchment of the Georges River, any concurrent construction activity is unlikely to result in cumulative impacts given the distance of this activity from the project. As described in section 6, there are no impacts to water resources expected to occur as a result of construction or operation of the project. This project has not been constructed.

7. Mitigation measures

7.1 Construction

As outlined in Section 6.2.1, disturbance of soils and handling of hazardous materials is required during construction. Complete elimination of these risks is not feasible and disturbance of soils for the project is unavoidable and inherent to the proposed activities. A detailed Construction Environmental Management Plan (CEMP) would be prepared and implemented for the Project. The CEMP would contain environmental control measures and a detailed Stormwater Management Plan (SMP) and Erosion and Sediment Control Plan (ESCP).

The SMP will detail relevant water quality management controls to promote water quality objectives during the construction phase and would be accompanied by detailed ESCP for key stages of the construction works. The ESCP would outline the implementation of erosion and sediment control measures in accordance with the Blue Book (Landcom, 2004), a key resource for the design and construction of stormwater management.

All surface water controls would be installed in accordance with *Managing Urban Stormwater: Soils and construction – Volume 1* (Landcom, 2004). Specific controls from that are applicable to the project would be included in the plans, including:

– minimising the risk of erosion and sedimentation, with a priority on minimising the extent and duration of disturbance. Disturbed areas should be stabilised as soon as practicable
– handling, management and disposal of soils, including the management of unexpected finds of contaminated materials, as recommended in the Contamination Preliminary Site Investigation (GHD, 2025b)
– handling of hazardous materials and procedures to manage spills to reduce and address soil and water contamination, including oils, coolant and chemicals
– identifying procedures, approvals and requirements in case of unexpected groundwater interception.

Prior to any soil disturbance or activities that pose a water quality risk during construction, drainage and other erosion sediment and environmental controls would first be implemented, in accordance with the ESCP.

7.2 Operation

Operational phase impacts associated with water should be managed as part of the detailed design of the project as well as considered within an OEMP.

7.2.1 Detailed design

The management of stormwater quantity and quality should be considered as part of the detailed design of the project. The detailed design of the stormwater management system would be undertaken following project approval and should include the following:

– Sizing of stormwater infrastructure to convey stormwater around the facility with consideration to Landcom, 2004 and DECC, 2008.
– Incorporate any detailed design mitigation measure identified within the Contamination Preliminary Site Investigation (GHD, 2025b), with regard to any potentially contaminated soils or geotechnical concerns.

7.2.2 Environmental procedures

It is recommended that operational controls relevant to water are included in LMS's existing environmental procedures for the site, or within a site-specific OEMP. The relevant document should include the following measures relevant to water:

– Procedures to maintain drainage features at the site, including open channels, culverts, stormwater control infrastructure, and sediment control basins and outlets. These should be maintained in accordance with the original design and kept free-draining.

– Identifying methods to appropriately handle hazardous materials such that they can be contained within the site within appropriate bunding during the operational phase. Specified responses to a pollution incident should be documented, in the form of a pollution incident response management plan (PIRMP), for the unlikely event that hazardous materials are conveyed outside of the site boundary.

With implementation of the mitigation measures as described above, no residual impacts from the project during the operational phase are anticipated.

8. Conclusions

A Water Impact Assessment has been prepared to address the impacts associated with the project, as required by the SEARs. The report outlines the existing environment and assesses potential impacts related to water quality, flooding, groundwater and water supply. The assessment identified potential impacts requiring mitigation measures include:

– Minor impacts associated with changes to water quality during the construction phase associated with erosion and sedimentation as well as the handling of hazardous materials. This risk may be exacerbated during times of wet weather. Recommended mitigation measures include developing a SMP and detailed ESCP in accordance with the NSW Blue Book, and with consideration for emergency response during times of flooding for the construction phase, as well as documenting environmental procedures for the operation of the facility relevant to handling of hazardous materials and unexpected finds (i.e. buried waste, potential groundwater interception in deeper excavations). With the implementation of these measures, residual risk was reduced to acceptable levels.
– Detailed design of site drainage for the site layout and perimeter drainage system to provide suitable conveyance of stormwater around the site.
– Preparation of an operational environment management plan to maintain infrastructure and specify actions and responses to handle hazardous materials appropriately.

Impacts associated with groundwater, soil resources, riparian land and water supply were not anticipated and accordingly no mitigation measures were identified. A search of nearby projects was reviewed and identified that cumulative impacts were not anticipated to arise from the project.

With the implementation of these measures, the project is not anticipated to result in material impacts to water resources.

9. References

ANZECC (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality.

ANZG (2018) Australian and New Zealand Guidelines for Fresh and Marine Water Quality.

Ball, J., Babister, M., Nathan, R., Weeks, W., Weinmann, E., Retallick, M., & Testoni, I. (2019). Australian Rainfall and Runoff: A Guide to Flood Estimation. Geoscience Australia.

BMT (2015) NSW MUSIC Modelling Guidelines, https://www.cityofparramatta.nsw.gov.au/sites/council/files/2021-04/nsw-music-modelling-guidelines-august-2015.pdf.

BOM (2005) Climate classification of Australia, http://www.bom.gov.au/climate/maps/averages/climate-classification/?maptype=kpn, accessed 15 April 2025.

BOM (2016) Design Rainfall Data System (2016), http://www.bom.gov.au/water/designRainfalls/revised-ifd/?design=very_frequent&sdmin=true&sdhr=true&sdday=true&nsd%5B%5D=&nsdunit%5B%5D=m&coordinate_type=dd&latitude=-34.047987&longitude=150.973294&user_label=&values=intensities&update=, accessed 17 April 2025

BOM (2025) Groundwater Dependent Ecosystems Atlas, http://www.bom.gov.au/water/groundwater/gde/map.shtml, accessed 17 April 2025.

Cleanaway (2025) Cleanaway Lucas Heights Landfill Annual Environmental Management Report (AEMR) 2024, https://cleanaway2stor.blob.core.windows.net/cleanaway2-blob-container/2025/03/AEMR-SSD-6835-2024-Lucas-Heights-Landfill.pdf.

Commonwealth of Australia (2014a) National Native Title Register, https://www.nntt.gov.au/searchRegApps/NativeTitleRegisters/Pages/Search-National-Native-Title-Register.aspx, accessed 14 April 2025.

Commonwealth of Australia (2014b) Native Title Vision (NTV), https://nntt.maps.arcgis.com/apps/webappviewer/index.html?id=6af521616eff4f34b503c1ef4dd83720, accessed 14 April 2025.

DCCEEW (2019) NSW Landuse 2017 v1.5, https://datasets.seed.nsw.gov.au/dataset/nsw-landuse-2017-v1p5-f0ed-clone-a95d, accessed 14 April 2025.

DCCEEW (2024) Flood risk management toolkit. https://www.koala.nsw.gov.au/topics/water/floodplains/flood-risk-management-toolkit, accessed 14 April 2025.

DECCW (2006) NSW Water Quality and River Flow Objectives, https://www.environment.nsw.gov.au/ieo/, accessed 14 April 2025.

Department of Agriculture and Water Resources (2013) National Water Quality Management Strategy Guidelines for Groundwater Quality Protection in Australia, https://www.waterquality.gov.au/sites/default/files/documents/guidelines-groundwater-quality-protection.pdf.

Douglas Partners (2024) Groundwater Management Plan – Lucas Heights Resource Recovery Park, prepared for Cleanaway Operations Pty Ltd.

DPE (2013) Policy & Guidelines for Fish Habitat Conservation & Management (Update 2013).

DPE (2015) Sutherland Shire Local Environment Plan 2015 Flood Planning Map (FLD_001A), https://www.planningportal.nsw.gov.au/publications/environmental-planning-instruments/sutherland-shire-local-environmental-plan-2015?redirectFromInterimPage=true.

DPE (2022a) Flood Risk Management Manual

DPE (2022b) Guidelines for Controlled activities – Guidelines for instream works on waterfront land

DPE (2023) Flood impact and risk assessment - Flood risk management guideline LU01.

DPE Water (2023) Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources 2023 – High Priority Groundwater-Dependent Ecosystem Map, https://water.dpie.nsw.gov.au/__data/assets/pdf_file/0005/568940/greater-metropolitan-region-groundwater-sources-2023-gde-map-GDE037_V1.pdf.

DPI (2012) NSW Aquifer Interference Policy.

DPIE (2022a) Cumulative Impact Assessment Guidelines for State Significant Projects.

DPIE (2022b) eSPADE version 2.2.0, https://www.environment.nsw.gov.au/eSpade2Webapp/#, accessed April 2025.

DPIE (2025) Georges River, https://water.dpie.nsw.gov.au/about-us/learn-about-water/basins-and-catchments/catchments/georges#:~:text=The%20Georges%20River%20catchment%20is%20in%20Sydney%20and,rivers%20are%20the%20major%20rivers%20in%20the%20catchment, accessed 14 April 2025.

DPSI (2025) Riverstyles in NSW mapping tool https://trade.maps.arcgis.com/apps/webappviewer/index.html?id=25d05de7453d4b0eb54783f84d319f0c

Geoscience Australia (2024) Elvis - Elevation and Depth - Foundation Spatial Data

GHD (2015) Lucas Heights Resource Recovery Park Groundwater Assessment, prepared for SITA Australia Pty Ltd, https://majorprojects.planningportal.nsw.gov.au/prweb/PRRestService/mp/01/getContent?AttachRef=SSD-6835%2120190227T083958.711%20GMT.

GHD (2025a) LHRRP Mill Creek Aquatic Ecology Spring 2024 and Autumn 2025 Baseline Report.

GHD (2025b) Lucas Heights Bioenergy Facility Preliminary Site Investigation for Contamination, prepared for LMS Energy Pty Ltd.

GHD (2025c) Lucas Heights Bioenergy Facility SSD Scoping Report, prepared for LMS Energy Pty Ltd.

GHD (2025d) Lucas Heights Bioenergy Facility Flare Installation Modification Report, prepared for LMS Energy Pty Ltd.

GHD (2025e) Lucas Heights Geotechnical Investigation; Geotechnical Investigation Report, prepared for LMS Energy Pty Ltd.

IECA (2008) Best Practice Erosion and Sediment Control. International Erosion Control Association (Australasia), Picton NSW

Landair Surveys (2025) LMS Energy Feature-A Survey Lucas Heights Landfill, prepared for LMS Energy Pty Ltd.

Landcom (2004) Managing Urban Stormwater: Soils and Construction. Parramatta, NSW, Australia.

LMS Energy (2025) Existing Site Stormwater Layout.

OEH (2017) Risk-based Framework for Considering Waterway Health Outcomes in Strategic Land-use Planning Decisions, https://www.epa.nsw.gov.au/sites/default/files/risk-based-framework-waterway-health-strategic-land-use-planning-170205.pdf.

MLEI Consulting Engineers (2025a) Proposed Site Civil Works Concept Plan, prepared for LMS Energy Pty Ltd.

MLEI Consulting Engineers (2025b) Proposed Site Civil Works – Concept Stormwater Management Plan, prepared for LMS Energy Pty Ltd.

Morrow Geotechnics Pty Ltd (2024) Dewatering Management Plan - 1-47 AND 51 PRESIDENT AVE & 178-186 WILLARONG ROAD CARINGBAH NSW, prepared for Builtcom Developments President Square Pty Ltd.

Nearmap (2025) Nearmap MapBrowser, https://apps.nearmap.com/maps/#/slK_xL9nSsKDs_TTse4umA/@-34.0480690,150.9735693,18.00z,0d/V/20250218 (imagery dated 18 Feb 2024).

NHMRC & NRMMC (2011) Australian Drinking Water Guidelines.

NSW DCCEEW (2024) High Ecological Value Aquatic Ecosystem (HEVAE) Instream Value of Freshwater Rivers in NSW, https://datasets.seed.nsw.gov.au/dataset/high-ecological-value-aquatic-ecosystem-hevae-instream-value-of-freshwater-rivers-in-nsw.

NSW Department of Mineral Resources (1985), Wollongong – Port Hacking 1:100,000 Geological Map, https://gmaps.geoscience.nsw.gov.au/100K/WollongongPortHacking/.

NSW EPA (2024) Environmental Protection Licence 5065, https://app.epa.nsw.gov.au/prpoeoapp/ViewPOEOLicence.aspx?DOCID=305123&SYSUID=1&LICID=5065, accessed 24 March 2025.

Planning NSW (2025), Major Projects Planning Portal, https://www.planningportal.nsw.gov.au/major-projects, accessed 24 March 2025.

Queensland Government's Department of Environment, Tourism, Science and Innovation (DETSI) (2025). Patched point climate data was obtained from the Scientific Information for Land Owners (SILO) database.

SEED (2024) NSW Department of Climate Change, Energy, the Environment and Water, NSW Wetlands, https://datasets.seed.nsw.gov.au/dataset/nsw-wetlands047c7.

SES (2024) Georges River, https://www.ses.nsw.gov.au/local-information-3.

Sutherland Shire Council (2015) Sutherland Shire Development Control Plan 2015 – Chapter 38: Stormwater and Groundwater Management, https://www.sutherlandshire.nsw.gov.au/__data/assets/pdf_file/0016/6712/38-stormwater-and-groundwater-management-pdf.pdf.

Sutherland Shire Council (2018) Shire Maps, https://mapping.ssc.nsw.gov.au/ShireMaps/?layerTheme=Planning/Zoning, accessed 24 March 2025.

Sutherland Shire Council (2024a) Sutherland Shire Local Environment Plan 2015, https://legislation.nsw.gov.au/view/html/inforce/current/epi-2015-0319#sec.5.21

Sutherland Shire Council (2024b) 2023/24 Sutherland Shire Waterways Health Report Card, https://www.sutherlandshire.nsw.gov.au/__data/assets/pdf_file/0023/97151/2023-2024-Waterways-Health-Report-Card.pdf, accessed 14 April 2025.

Sutherland Shire Council (2025) Strategic Water Monitoring Program – SwaMP, https://www.sutherlandshire.nsw.gov.au/your-environment/pollution/water-quality-monitoring.

Urbis (2023) 762-764 Forest Road and 21 Prospect Road, Peakhurst Health Services Facility, prepared for ICC Development Group.

WaterNSW (2023) Using MUSIC in Sydney Drinking Water Catchment, https://www.waternsw.com.au/documents/crps/general-development/stormwater/Using-MUSIC-in-the-Sydney-Drinking-Water-Catchment.pdf.

WaterNSW (2025) WaterNSW Water Information Hub, https://realtimedata.waternsw.com.au/water.stm, accessed 25 April 2025.

Appendices

Appendix A

Agency advice on SEARs

Table A.1 Agency Advice to SEARs

Advice to SEARs	Section
BCS Environmental Assessment Requirements	
The EIS must map the following features relevant to water and soils including:	
Acid sulfate soils (Class 1, 2, 3 or 4 on the Acid Sulfate Soil Planning Map).	There are no Acid Sulfate Soils underlying the project site according to the Sutherland Shire LEP (Sutherland Shire Council, 2018).
Rivers, streams, wetlands, estuaries (as described in s.4.2 of the BAM).	Figure 4.3
Wetlands as described in s.4.2 of the BAM.	Figure 4.3
Groundwater	Figure 4.7
Groundwater dependent ecosystems.	Figure 4.7
Proposed intake and discharge locations.	No intake is proposed, discharge locations are mapped in Figure 5.1.
The EIS must describe background conditions for any water resource likely to be affected by the development, including:	
Existing surface and groundwater.	Sections 4.4, 4.5 and 4.7
Hydrology, including volume, frequency and quality of discharges at proposed intake and discharge locations.	Hydrology: section 4.4 Discharges: section 6.1
Water Quality Objectives (as endorsed by the NSW Government) including groundwater as appropriate that represent the community's uses and values for the receiving waters.	Section 4.1
Indicators and trigger values/criteria for the environmental values identified above in accordance with the ANZECC (2000) Guidelines for Fresh and Marine Water Quality and/or local objectives, criteria or targets endorsed by the NSW Government.	Section 6.2.2
Risk-based Framework for Considering Waterway Health Outcomes in Strategic Land-use Planning Decisions	Section 6.2
The EIS must assess the impact of the development on hydrology, including:	
Water balance including quantity, quality and source.	Section 6.5
Effects to downstream rivers, wetlands, estuaries, marine waters and floodplain areas.	Sections 6.1, 6.2 and 6.3
Effects to downstream water-dependent fauna and flora including groundwater dependent ecosystems.	Sections 6.2 and 6.4
Impacts to natural processes and functions within rivers, wetlands, estuaries and floodplains that affect river system and landscape health such as nutrient flow, aquatic connectivity and access to habitat for spawning and refuge (e.g. river benches).	Sections 6.1, 6.2 and 6.3
Changes to environmental water availability, both regulated/licensed and unregulated/rules-based sources of such water.	Section 6.5
Mitigating effects of proposed stormwater and wastewater management during and after construction on hydrological attributes such as volumes, flow rates, management methods and re-use options.	Section 7
Identification of proposed monitoring of hydrological attributes.	Not proposed
NSW Environmental Protection Authority	
Assessment of water and wastewater management In general water pollution should be avoided in the first instance where the reuse and recycling of treated wastewater and stormwater should be encouraged where it is safe and practicable to do so and provides the best environmental outcome. However, if reticulated sewer is available any polluted water (including but not limited to process waters, wash down waters and sewage) should be collected on the site and directed to sewer in accordance with Council/Wastewater Providers trade waste requirements. However, where water pollution cannot be avoided, an assessment should be documented on its potential impact on receiving waters. If the impacts are unacceptable, mitigation measures that prevent or minimise impacts on water quality should be implemented. The EPA guidance on Water Pollution Discharge Assessments in NSW should be consulted when undertaking a water impact assessment.	Sections 6.1, 6.2, 6.5 and 7

Appendix B

Soil hazard loss assessment

The soil loss hazard was quantified using the Revised Universal Soil Loss Equation (RUSLE):

$$A = R \times K \times LS \times P \times C$$

Where, A = computed soil loss (tonnes/ha/yr)

R = rainfall erosivity factor

K = soil erodibility factor

LS = slope length/gradient factor

P = erosion control practice factor

C = ground cover and management factor

Table B.1 Revised Universal Soil Loss Equation Parameters

Parameter	Value	Justification
Soil erodibility (K) factor	0.05	Espade (2024) – taken as the most conservative value, the maximum K values at the site range from 0.048 to 0.05
Practice (P)	1.3	Landcom (2004), representing compacted/smooth surfaces
Cover (C)	1.0	Landcom (2004), representing completely stripped surfaces during construction
Rainfall erosivity (R)	2411.4	Based on $R = 164.74(1.1177)^{S}S^{0.6444}$ Where S is the 2 year ARI, 6-hour ARI rainfall event [mm/hr] (Landcom 2004). For the site, S = 10.5 mm/hr (BOM 2016).
Slope length/gradient factor (LS)	0.602	Espade (2024)
Total area (ha)	approximately 1.8 ha	Maximum potential site disturbance area
Total soil loss (t/year) Total soil loss (m^3/ year)	169.9 t/yr 130.7 m^3/yr	Calculation Assumes 1.3 t/m^3

To inform the staging of the proposed works, the annual soil loss results were extrapolated to a monthly soil loss risk, based on monthly average rainfall. The monthly soil loss hazards are shown in Table B.2.

Table B.2 Monthly soil loss risk hazard

Month	% of R	Soil loss (t/ha/month)	Soil loss (m^3/month)	Hazard
Jan	9.16%	8.65	11.98	very low
Feb	10.49%	9.90	13.71	very low
Mar	11.18%	10.56	14.62	very low
Apr	9.40%	8.87	12.28	very low
May	8.94%	8.44	11.69	very low
Jun	9.94%	9.38	12.99	very low
Jul	7.51%	7.09	9.82	very low
Aug	6.31%	5.96	8.25	very low
Sep	5.34%	5.04	6.98	very low
Oct	6.58%	6.22	8.61	very low
Nov	7.67%	7.24	10.02	very low
Dec	7.47%	7.05	9.76	very low

ghd.com

→ The Power of Commitment